NAVFAC SAFETY PERFORMANCE AND THE USE OF BEST PRACTICES TO REDUCE LOST WORKHOURS AND ACCIDENTS

by

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ABSTRACT

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This thesis analyzes the safety performance of several U.S. Naval Facilities Engineering Command (NAVFAC) projects as they compare to the construction industry as a whole and to the Construction Industry Institute (CII) Member companies. Safety success on a construction project is measured by examining the Lost Workday Case Incident Rate (LWCIR), Recordable Incident Rate (RIR), and the Fatality Incident Rate (FIR). This thesis will endeavor to compare and contrast performance of the above groups based on these metrics.

CII (a history can be found in the "Background" section) member companies endeavor to use many safety best practices on their projects. Extensive research by CII has shown that the most successful projects (with increased safety performance)

have used many of these best practices. Several NAVFAC projects shall be reviewed to determine frequency of use of these best practices. Furthermore, the author will examine the NAVFAC guide specification and identify contractual requirements for use of best practices in the contractor's "Site Specific Safety Plan." Conclusions and recommendations are presented based on the results of the analysis.

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1. Introduction

1.1 Purpose

The purpose of this thesis is to analyze the use of several proven safety best practices on construction projects and further evaluate the overall performance of U.S. Naval Facilities Engineering Command (NAVFAC) projects as they relate to use of these practices. Comparisons to the nationwide construction industry and to the Construction Industry Institute (CII) will be made to demonstrate how well NAVFAC projects compare to the industry as a whole.

The Construction Industry Institute (CII) is the collaborative effort by construction owners, designers, and contractors to further the industry through research. Founded in 1983, the CII is an internationally recognized forum. Its mission is to improve the total quality and cost effectiveness of capital projects of its membership. Over ninety member companies have funded CII research projects that involve more than 30 of the nation's top engineering and construction programs in academia (CEPM 1994).

CII has tracked safety performance since 1989, and figures obtained from the Occupational Standards and Health Organization (OSHA) are compared with CII statistics to show the relative safety performance for each group. Unfortunately,

NAVFAC did not track LWCIR, RIR, and FIR safety data until the beginning of 1996.

In 1996 NAVFAC started maintaining records of LWCIR (on a quarterly basis) for all completed construction projects under their purview (Schilder 1998). This limited historical information should be adequate to indicate recent safety performance on NAVFAC projects and possibly show any trends for the future.

This thesis will attempt to measure current NAVFAC safety performance and show whether Navy projects are effectively using the best practices, which CII has determined will positively influence safety. The CII Benchmarking and Metrics (BM&M) Completed Project Data (Version 2.0) Survey was sent to all CII Member Companies in 1996 to quantify the benefits of best practice implementation. NAVFAC is a member company in CII and replied to the survey request providing information on six projects. By comparing these six projects with projects supplied by other members of CII, the author hopes to show how well each measures up to the rest of CII and extend that comparison to the industry as a whole.

It should be noted that CII member companies are grouped and divided into "Owners" and "Contractors" for the purposes of determining an average LWCIR, RIR, and FIR for comparison to OSHA. Since the CII membership is made up of both private and public organizations, all of the recommended best practices may not lend themselves to use in the public contracting arena.

1.2 Scope

This thesis will analyze the safety performance of NAVFAC projects as they compare to the 157 CII member company projects in the BM&M database. The criteria for measuring project performance will be the standard CII performance criteria, to be discussed in more detail in Chapter 3. Additional subjective data for the use of best practices will be obtained through interviews with various NAVFAC project managers and surveys of eighteen completed NAVFAC projects. These surveys will (for the body of projects reviewed) indicate the extent of best practice use on NAVFAC projects, and serve to reinforce whether the six projects in the CII database are truly representative of most construction projects administered by NAVFAC.

1.3 Objectives

The overall goal of this study is improvement of NAVFAC safety practices. To achieve this goal the following objectives will be met:

1. Characterize NAVFAC's safety performance in relation to CII and industry metrics.
2. Analyze the use of safety best practices on NAVFAC projects as determined by sample survey responses.

3. Recommend areas for improvement and sustainment of NAVFAC safety best practices.

1.4 Outline of Thesis

Chapter 2 will discuss the background of safety in the construction industry and NAVFAC. Chapter 3 explains research methodology for data gathering and analysis. The research data collected for this thesis is presented in Chapter 4. Analysis of the data is contained in Chapter 5. Conclusions are presented in Chapter 6. Recommendations for actions and future research are offered in Chapter 7.

2. Background

2.1 Safety in the Construction Industry

Safety can be viewed in the most basic terms as the prevention of accidents. The construction industry in the United States accounts for approximately 10% of the gross domestic product, with a annual dollar volume of about $450 billion. The industry employs five percent of the nation's work force, but experiences 20 percent of all the traumatic occupational fatalities and 12 percent of the total number of disabling injuries (Liska 1993).

Taking these factors into consideration, workers' compensation insurance costs have been on the rise for the last decade. Studies indicate that it is not uncommon for contractors with poor safety records to pay twice the premium cost of those with excellent safety records (Liska 1993). Development and implementation of comprehensive site safety and health plans help reduce accidents and therefore, lower the overall cost of construction projects. The U. S. Navy has always been sincerely concerned with the health and welfare of its personnel. Safety remains a top priority in all divisions of the force (see Appendix A). Therefore, it seems very reasonable to demand the same care for the construction workers under the employment of private contractors working on NAVFAC projects.

Everyone supports the concept of project safety. Unfortunately, when it comes to spending time and money on safety improvements, many on-site managers do not feel it is vital to the success of their project. There is a failure to realize direct and indirect cost savings. However, to no one's surprise, research has shown that the development and implementation of effective safety programs reduces accidents (Liska 1993).

Heinrich (1959) performed research on the conditions and circumstances that surround industrial accidents and developed an accident-cause analysis theory (Liska 1993). Widner (1973) later modified this theory. The modified "domino theory" as it is known is shown in Figure 1. The "basic causes" block refers to factors such as a lack of motivation and other factors such as hazards left uncorrected. The latter is a factor for which management has much control. So, a quick assessment of the Domino Theory suggests that management is the most important factor in the accident sequence.

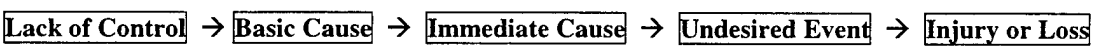


Figure 1. Domino Theory Updated (Widner, 1973)

Other studies indicate that safety should be managed like any other company function. An analysis of fatalities showed that 90 percent of construction deaths were preventable and in 70 percent of the cases positive action by management could have saved lives (Liska 1993).

This pivotal role that management plays in the overall safety of the project clearly demands that a comprehensive safety program be required and strictly followed throughout the project. NAVFAC has always required contractors to submit a site-specific safety plan and have it approved prior to the commencement of any work. The latest NAVFAC guide specification is included in Appendix B. The contractual language fully supports the concept, but the responsibility to review and approve the safety program falls upon the NAVFAC Resident Officer in Charge of Construction (ROICC) or project manager. However, only requiring the contractor to strictly adhere to the requirements of the specification will not result in a safe project. The project manager must constantly monitor and insist that the contractor closely follow the approved plan.

2.2 Zero Injury Technique Defined

In 1993, the Construction Industry Institute (CII) published the results of their Zero Accidents Task Force, which was formed to research worker safety. The task force hoped to show owners and contractors how to achieve zero accidents on construction projects.

The task force defined "good in safety" as those projects with LWCIR greater than 1.0 up to 4.4 LWCIR (Zero Accidents Task Force 1993). "Excellent in safety" was defined as those projects with an LWCIR of 1.0 or below. Additionally, safety

excellence was further defined as achieving at least one period of 1,000,000 work hours without a project lost workday.

Studying "good" and "excellent" safety projects, researchers identified five "High-Impact Zero Injury Safety Techniques" that potentially produce the greatest impact on achieving excellent safety performance and these techniques can be found in Table 1. These techniques can make the difference between "good" and "excellent" performance. When these top five recommended safety practices are part of a quality safety program the contractor can expect improved safety performance to be the result. The research did not presume to suggest that implementing the five High-Impact Zero Injury Techniques alone would result in zero injuries, rather these five practices coupled with a comprehensive safety program tended to result in zero lost workdays for the body of projects researched. These five techniques will be discussed in later Chapters in terms of their usage on NAVFAC projects.

2.3 Reasons to Implement an Effective Safety Program

Small companies (those with less than $25 million in billings annually) tend not to have safety programs and for those that do these programs are often inadequate. As a result, these contractors experience most of the accidents in the industry (Liska 1993). It's no surprise that safety program implementation is the preferred method of accident prevention.

Table 1. Five High-Impact Zero Injury Safety Techniques and the Most Significant Sub-elements (Zero Accidents Task Force 1993).

Five High-Impact Zero Injury Safety Techniques

1. Safety Pre-Project/Pre-Task Planning

Pre-Project	Pre-Task
- Safety Goals	- Task hazard analysis
- Safety person/personnel	- Task training

2. Safety Orientation and Training

- Site Orientation
- Owner involved in orientation
- Safety policies and procedures

3. Written Safety Incentive Program

- Cents per hour for workers
- Spot cash incentives used with workers
- Milestone cash incentives used with workers
- End of project incentives given to workers

4. Alcohol and Substance Abuse Program (ASAP)

- Screening done for alcohol and drugs
- Screening conducted at random
- Inspections for contraband conducted
- Post accident screening done for all employees
- All project contractors have ASAPs

5. Accidents/Incidents Investigations

- Incidents investigated
- Incidents reported to home office
- Accidents without injury investigated
- Project accident review team established for all accidents or incidents
- Project work exposure hours and safety statistics reported to home office

(Notes: The sub-elements are not listed in priority order. "Incident" replaces the historical term "Near Miss.")

The following are several of the most important reasons for an effective safety program (Liska 1993):

1. Project managers have moral and legal obligations to provide a safe place to work free from hazards.
2. Economic reasons, such as high insurance premiums and other hidden, indirect costs associated with accidents on the job site force the prudent manager to maintain a safe project. High insurance premiums mean more cost to the contractor and subsequently this cost is passed on to the owner paying for the project. In many cases, unsafe contractors are unable to compete in a low-bid contracting environment.
3. Safety awareness will be heightened over the impact of safety performance on the overall project cost and, therefore, owners and contractors will strive for safer management.
4. Accidents will have adverse effects on a contractor's reputation and will result in an unfavorable image for the owner.

Many of the contractors who work for NAVFAC can be considered "small companies." It is critical that a thorough safety program be required regardless of the monetary value of the construction project being undertaken. The owners and contractors alike should strive to maintain safe construction projects no matter what

the size or duration. The first step to a safe project is the existence and implementation of a comprehensive safety program.

2.4 The High Cost of Safety Programs

Hinze (1988) conducted a study questioning many contractors in the Puget Sound, Washington and the San Francisco Bay, California areas about safety costs. These contractors and subcontractors were asked to answer quality, safety, and schedule questions in relation to their emphasis on profits. The results indicated that superintendents who place quality as a high priority have safer jobs than those superintendents whose priority is strictly meeting cost and schedule demands.

The type of contract governing the project will also affect the pressure from management felt by the superintendent to control costs. One of the respondents stated that he was never given a large enough safety budget on a bid job (Hinze 1988). In order to get all the safety items he felt were required for the job, he had to run over the safety budget. This can pose a grave problem for contractors who desire to implement an effective safety program in a low-bid contracting environment. The answer for public owners may be to require pre-qualification of bidders based on their safety records. This would eliminate contractors with poor safety records and, therefore, allow all bidders to include the cost of their safety programs in their bid. An excellent pre-qualification form is incorporated in Appendix C.

3. Research Methodology

This Chapter outlines the methods used to gather the data presented in this thesis. Additionally, a brief description of the analysis techniques is presented.

3.1 Data Gathering

An extensive literature review was conducted prior to beginning the research. The detailed work by CII on benchmarking construction best practices will be the basis for this thesis. A literature review was conducted from numerous CII studies. Other sources pertaining directly to construction safety performance measurement were not found. Much of the data used to support conclusions and recommendations comes from the responses to the CII BM&M Completed Project Data (Version 2.0) survey of 1996. The information presented here will reference prior literature reviews and the data collected in the survey. Additionally, more recent research into NAVFAC projects will be presented. Comparisons between the previously collected CII data and new NAVFAC data will enable measurement of safety performance within NAVFAC. As stated earlier, NAVFAC is a member company of CII and, as such, has six construction projects in the BM&M database.

CII has collected safety data from its member companies since 1989. Information presented in this thesis covers safety data collected from 1989 to 1996.

Appendix D is a sample Safety Data Request form. Appendix E shows safety information for CII owners and Appendix F shows information for CII Contractors. The construction industry information was available from the Bureau of Labor Statistics worldwide website at http://stats.bls.gov/oshhome.htm.

To perform this study, CII was contacted and permission received to access and use their information for this thesis. The author quickly discovered that NAVFAC had not reported LWCIR, RIR, and FIR for the years 1989 to 1995. The Deputy Director of Safety at NAVFAC, Mr. Craig Schilder, was contacted and interviewed. He graciously offered his full assistance and confirmed that NAVFAC did not maintain records on the aforementioned statistics prior to 1996. However, in 1996, NAVFAC began requiring contractors to submit quarterly information on their reportable injuries and lost workdays. This information can be found in Chapter 4. Additionally, Mr. Schilder was responsible for providing the most recent copy of the NAVFAC guide specification found in Appendix B (Schilder 1998).

3.1.1 CII Benchmarking and Metrics Version 2.0 Survey Data

CII member companies actively apply CII-proven best practices on their construction projects. As a result, in many cases, the project's overall safety performance is better than the industry average. These companies answered questions regarding safety best practices on the BM&M surveys they completed. The

results published by the Zero Accidents Task Force identifying five "High-Impact Zero Injury Safety Techniques" were used to develop the safety survey questions. This thesis shall concentrate on these "critical few" measures of best practice performance.

Questions 18 through 35 of the BM&M survey asked questions regarding safety practices. A sample survey response is included in Appendix H. Question 18 collected quantitative project accident data taken from the OSHA 200 log, a document required on all projects. Respondents were given the option to write "unknown" in the table, because many owners did not track information on the accidents of contractors on their projects. In fact, all six NAVFAC projects surveyed answered "unknown" to this question.

Questions 19 through 35 asked for practice utilization data. The first eight questions (19 through 26) were based on a "Yes/No/Not Applicable" construct. The next eight questions (27 through 34) used an ordinal treatment of "Always/ Sometimes/Seldom/Never." The final safety question (no. 35) asked the contractors to rate the owner's commitment to safety on a scale of one to ten.

3.1.2 Additional Best Practice Project Information

Since only six NAVFAC projects were part of the CII BM&M database, a survey was developed to gather more data regarding the use of best practices.

ROICC project managers currently attending the University of Texas at Austin were asked to respond to these surveys for projects they had recently completed. Eighteen survey responses representing 18 completed NAVFAC projects were received. A sample survey can be found in Appendix I.

3.2 Analysis Methods

The LWCIR, RIR, and FIR have been used as a measure of on-the-job safety for many years. The Bureau of Labor Statistics, Department of Labor computes these rates using three simple formulas. A lost workday case results in one or more days away from work or restricted activity or both. The formula for LWCIR is as follows (Levitt 1993):

$$LWCIR = \frac{\textit{Number of lost workday cases x 200,000 hours}}{\textit{Labor hours worked}} \qquad \textit{Eq. (1)}$$

The 200,000 hours in the formula represents the equivalent of 100 employees working 40 hours per week, 50 weeks per year, and provides the standard base for the incident rates.

A recordable incident is a work-related death or illness and any injury that results in: loss of consciousness, restriction of work or motion, transfers to another

job, or requires medical treatment beyond first aid. The formula used for computing the RIR is as follows (Levitt 1993):

$$RIR = \frac{\textit{Number of recordable incidents x 200,000 hours}}{\textit{Labor hours worked}} \qquad \textit{Eq. (2)}$$

The FIR deals strictly with the number of fatalities suffered on the project. The formula for computing the FIR is as follows (Levitt 1993):

$$FIR = \frac{\textit{Number of fatalities x 200,000 hours}}{\textit{Labor hours worked}} \qquad \textit{Eq. (3)}$$

As stated earlier, the CII Zero Injury Task Force defined "good in safety" as those projects with LWCIR greater than 1.0 and up to 4.4 LWCIR (Zero Accidents Task Force 1993). "Excellent in safety" is defined as those projects with LWCIR of 1.0 or below. Additionally, safety excellence is further defined as achieving at least one period of 1,000,000 work hours without a project lost workday. This quantitative measurement shall be the basis for determining "good" versus "excellent" safety performance. LWCIR and RIR results are presented for the years 1989 to 1996. CII owner and contractor rates are contrasted with the industry. The average yearly rates are plotted against one another in Chapter four.

The summated rating scale, a commonly used tool in survey research, was utilized to calculate a practice use index from the answers to the BM&M safety

practice questions. The practice use index is based on a scale of zero to ten with each question response uniformly weighted. Thus, if all practice elements were used to the highest degree the practice index would be a ten, and if no practice elements were used at all the practice index would be a zero. In the example in Table 2, sample responses to the safety practice use elements are shaded. These response values, or scores, are recorded in the last column of each practice section and they are totaled in the lower right hand corner of the table. In order to scale each practice use index to a value between zero and ten, each total is divided by the number of elements in the practice use section [in this case the total (11.67) is divided by 16]. In Chapter 5 the six NAVFAC projects within the CII BM&M database were segregated and each project's practice score was plotted separately versus the quartile plot for all CII owner projects.

The additional best practice project survey information was used subjectively to determine if the six NAVFAC projects fairly represent the realistic average use of best practices on NAVFAC projects. The resulting measure of NAVFAC safety performance best practice usage indicates how well it compares to the remainder of CII member companies and, in turn, the industry.

Table 2. Safety Practice Use Index Example

Question		Yes	No	Score
19.	This project had a written site-specific safety plan.	1.00	0.00	1.00
20.	This project had a written site-specific emergency plan.	1.00	0.00	1.00
21.	This project had a site safety supervisor.	1.00	0.00	1.00
22.	The site safety supervisor for this project was full-time.	1.00	0.00	0.00
23.	This project had a written safety incentive program for hourly craft employees.	1.00	0.00	1.00
24.	Toolbox safety meetings were required.	1.00	0.00	1.00
25.	This project required prehire substance abuse testing of contractor employees.	1.00	0.00	1.00
26.	Contractor employees were randomly screened for alcohol and drugs.	1.00	0.00	0.00

Question		Always	Sometimes	Seldom	Never	NA	Score
27.	Substance abuse tests were conducted after an accident:	1.00	0.67	0.33	0.00	1.00	1.00
28.	Accidents were formally investigated:	1.00	0.67	0.33	0.00	1.00	0.67
29.	Near-misses were formally investigated:	1.00	0.67	0.33	0.00	1.00	0.33
30.	Senior management reviewed accidents:	1.00	0.67	0.33	0.00	1.00	0.67
31.	Safety was a high priority topic at all pre-construction and construction meetings:	1.00	0.67	0.33	0.00	1.00	1.00
32.	Safety records were a criterion for contractor/subcontractor selection:	1.00	0.67	0.33	0.00	1.00	0.00
33.	Pre-task planning for safety was conducted by foremen:	1.00	0.67	0.33	0.00	1.00	1.00
34.	Jobsite-specific orientation was conducted for new contractor and subcontractor employees:	1.00	0.67	0.33	0.00	1.00	1.00
TOTAL							**11.67**
Safety Practice Use Index							**7.29**

4. Presentation of Data

4.1 CII Safety Data Gathering

In 1989, CII began an effort involving the collection of data from member companies to produce metrics that characterizes CII and the safety performance of its members. The member companies were asked to provide the number of recordable incidents, lost workday cases, lost workdays, fatalities, and the total labor hours for each year 1989 to 1996. For a sample of the Safety Data Request see Appendix D. Table 3 shows a breakdown of the Owner responses to these surveys. Column (1) lists the year, and column (2), (3), and (4) list the recordable incidents, lost workday cases, and fatalities respectively.

Table 3. CII Safety Data Request "Owner" Responses

Year/ No. of Responses (1)	Recordable Incidents (2)	Lost Workday Cases (3)	Fatalities (4)
1989 / 13	1,437	351	6
1990 / 14	2,130	423	5
1991 / 23	3,565	1,019	10
1992 / 26	2,605	546	3
1993 / 23	1,952	439	1
1994 / 30	2,622	594	7
1995 / 35	1,602	220	1
1996 / 26	3,172	753	14

The number of member companies responding has varied each year. It should be noted that only two owners were responsible for eleven of the fourteen fatalities that occurred in 1996 (see Appendix E, 1996). Nineteen eighty-nine had the lowest response of thirteen owners. Between 13 and 35 owners have responded each year and includes approximately 1.8 billion workhours over the eight-year period. This yields an adequate body of data to compare to the industry average.

Table 4 shows a breakdown of the Contractor responses to these surveys. Just as above, column (1) lists the year, and column (2), (3), and (4) list the recordable incidents, lost workday cases, and fatalities respectively.

Table 4. CII Safety Data Request "Contractor" Responses

Year/ No. of Responses (1)	Recordable Incidents (2)	Lost Workday Cases (3)	Fatalities (4)
1989 / 45	10,247	2,744	9
1990 / 52	10,488	2,769	15
1991 / 55	9,122	2,443	8
1992 / 57	8,115	2,290	9
1993 / 49	7,105	1,214	13
1994 / 51	6,151	1,830	9
1995 / 53	6,790	1,531	11
1996 / 46	5,732	1,271	4

Between 45 and 57 contractors have responded and includes approximately 2.5 billion workhours. This yields more than an adequate body of data to compare to the industry average. For a full presentation of the "Contractor" response data see Appendix F.

To enable comparison of CII member companies and other entities, the LWCIR, and RIR had to be calculated using reported total workhours. As discussed earlier, this quantifiable metric was used by the Zero Injury Task Force to classify safety performance. The Bureau of Labor Statistics tabulates and reports annually the industry averages for LWCIR and RIR at their site on the worldwide web at http://stats.bls.gov/oshhome.htm.

The LWCIR, RIR, and FIR were calculated for each response pertaining to the data collected from the Safety Data Requests for both owners and contractors. Table 5 shows the average RIR, LWCIR, and FIR for owners and Table 6 shows the same information for contractors. Column (1) lists the year, and column (2), (3), and (4) list the RIR, LWCIR, and FIR respectively.

Table 5. CII Safety Data Request "Owner" Rate Averages

Year/ No. of Responses (1)	Recordable Incident Rate (RIR) (2)	Lost Workday Case Incident Rate (LWCIR) (3)	Fatalities Incident Rate (FIR) (4)
1989 / 13	8.03	2.40	22.04
1990 / 14	7.54	1.72	13.24
1991 / 23	7.13	1.97	18.14
1992 / 26	4.71	1.02	4.91
1993 / 23	4.09	0.78	1.86
1994 / 30	4.58	1.24	11.52
1995 / 35	3.60	0.64	1.59
1996 / 26	2.50	0.20	5.93

Table 6. CII Safety Data Request "Contractor" Rate Averages

Year/ No. of Responses (1)	Recordable Incident Rate (RIR) (2)	Lost Workday Case Incident Rate (LWCIR) (3)	Fatalities Incident Rate (FIR) (4)
1989 / 45	10.21	3.39	6.65
1990 / 52	8.10	2.50	8.90
1991 / 55	6.30	1.94	4.36
1992 / 57	5.03	1.48	4.80
1993 / 49	4.53	1.25	6.19
1994 / 51	3.82	1.01	4.08
1995 / 53	3.10	0.81	4.24
1996 / 46	2.00	0.40	0.67

In Figure 2 the RIR for the CII owners and contractors is shown over time. The year is displayed along the x-axis and the average RIR is displayed along the y-axis. Ranging from a high of 10.21 to a low of 2.00, it shows a trend towards

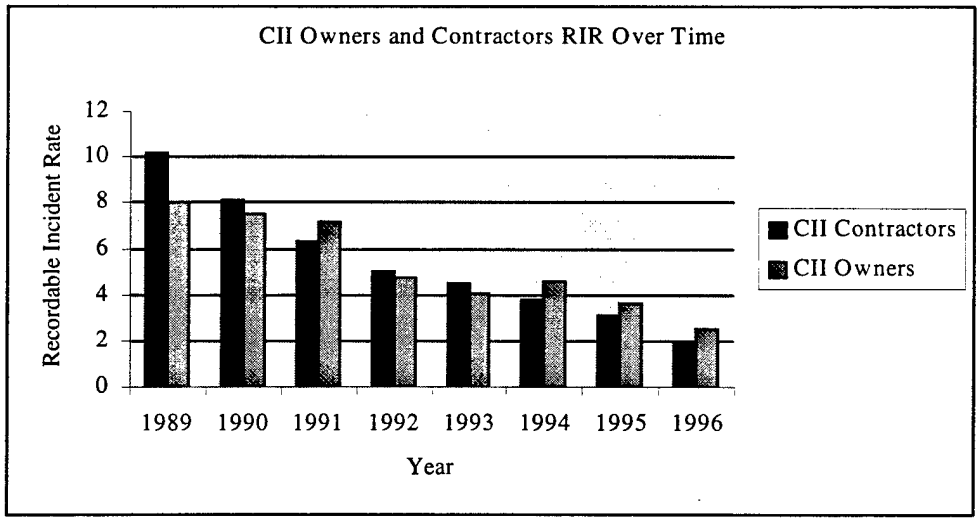


Figure 2. CII Owner versus Contractor RIR Plotted over Time

lower incidents over the years. Examination of the CII BM&M survey responses shows the average owner RIR for that body of projects to be 2.76 with a median of 1.21. The average CII BM&M contractor RIR was 2.66 with a median of 0.46. This is comparable to the CII safety data gathered from 1989 to 1996.

Figure 3 is a graph of the LWCIR for CII owners versus contractors over time; this graph also shows a downward trend. In this case the trend is towards fewer lost workdays. On average, for the years 1992, 1993, 1995, and 1996 CII owners were performing at a level defined as "excellent in safety" by the Zero Injury Task Force definition. The same would hold true for the contractors surveyed in 1994 through

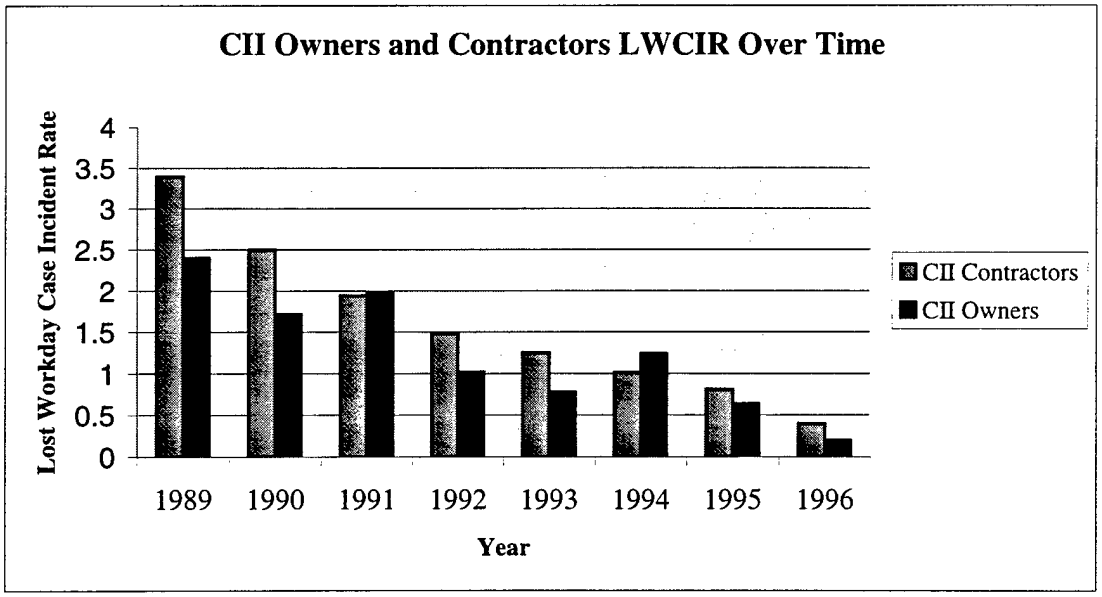


Figure 3. CII Owner versus Contractor LWCIR Plotted over Time

1996. As CII member companies begin to institute the wide spread use of best practices on all of their construction projects, it appears that overall safety will continue to improve with time. Examination of the CII BM&M survey responses shows the average owner LWCIR for that body of projects to be 0.52 with a median of 0.00. The average CII BM&M contractor LWCIR was 0.15 with a median of 0.00. This is comparable to the CII safety data gathered from 1989 to 1996.

4.1.1 Comparing CII with the Construction Industry

The Bureau of Labor Statistics (BLS), U.S. Department of Labor, calculates RIR and LWCIR and records the reportable information filed by contractors in the OSHA 200 Log. The BLS keeps statistics on the number of fatal accidents within a specific worker type, but does not calculate FIR. Therefore, this information cannot be compared graphically. Table 7 below shows the average RIR and LWCIR for the construction industry as compiled by BLS. Column (1) lists the year and column (2) and (3) list the LWCIR and RIR respectively.

Figure 4 is a comparison graph of the RIR for CII owners, contractors, and the overall industry. All show a downward trend over time. CII performance for the companies surveyed indicates less recordable incidents than the construction industry as a whole.

Table 7. Construction Industry Safety Data Rate Averages Reported by Contractors (Bureau of Labor Statistics 1998)

Year (1)	Recordable Incident Rate (RIR) (2)	Lost Workday Case Incident Rate (LWCIR) (3)
1989	14.3	6.8
1990	14.2	6.7
1991	13.0	6.1
1992	13.1	5.8
1993	12.2	5.5
1994	11.8	5.5
1995	10.6	4.9
1996	9.9	4.5

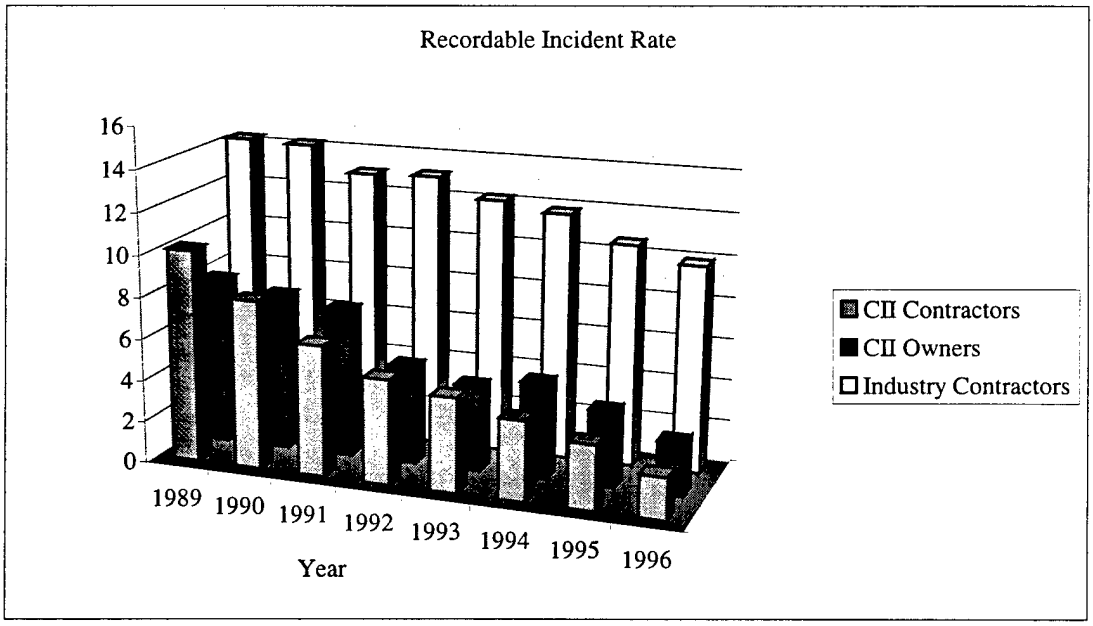


Figure 4. Recordable Incident rate Comparison

Figure 5 is a comparison graph of the LWCIR for CII owners, contractors, and the overall industry. This graph, just as the others, shows a downward trend over

time. CII performance for the companies surveyed indicates safer project performance when compared to the construction industry as a whole.

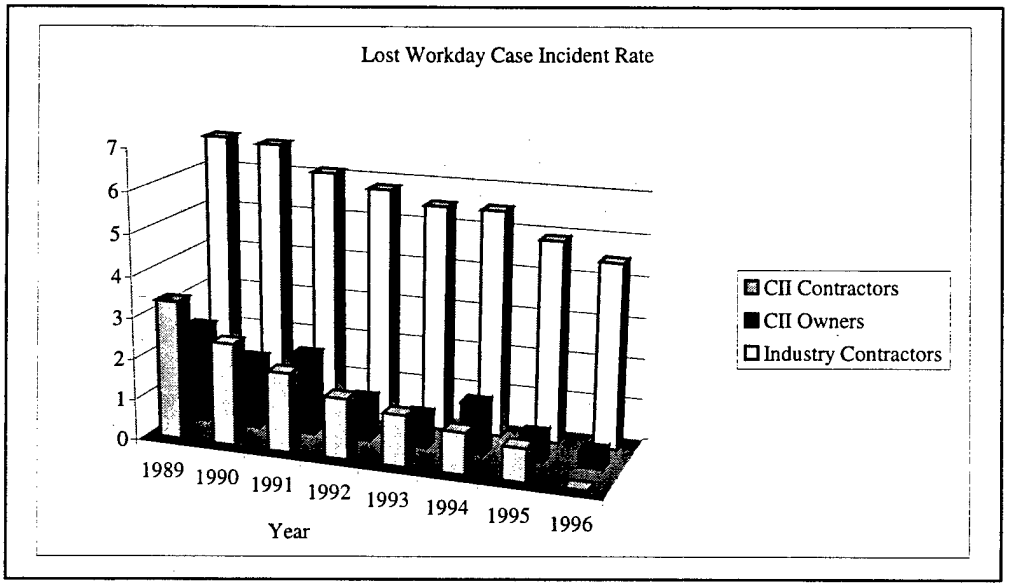


Figure 5. Lost Workday Case Incident Rate Comparison

4.1.2 Comparing CII to NAVFAC Data for 1996 and 1997

Quarterly information provided by NAVFAC for 1996 and 1997 showed comparisons to CII, industry contractors, and the U.S. Army Corps of Engineers. Table 8 below shows the average LWCIR data collected by NAVFAC. Column (1) lists the year, and column (2), (3), (4), and (5) list the average LWCIR for the construction industry, CII Owners, the U.S. Army Corps of Engineers (USACE), and NAVFAC respectively. As of this report, industry and CII information was not

available for 1997. It is interesting to note that USACE information shows that their number of lost workdays for the past eight years has been very low. This graph shows NAVFAC to have an LWCIR of 0.63 for 1996 and 0.51 for 1997 as compared to CII owners with an LWCIR of 0.40 and CII contractors with 0.20. NAVFAC performance for this year indicates more lost workdays on average than CII. More information is needed to determine where NAVFAC lies when compared with CII and the industry on LWCIR and RIR.

Table 8. Comparison of LWCIR Rate Averages with USACE & NAVFAC (Davidson 1998)

Year (1)	Industry Contractors (2)	CII Owners (3)	USACE (4)	NAVFAC (5)
1989	6.8	2.40	1.06	NA*
1990	6.7	1.72	0.88	NA*
1991	6.1	1.97	1.09	NA*
1992	5.8	1.02	1.14	NA*
1993	5.5	0.78	0.98	NA*
1994	5.5	1.24	0.76	NA*
1995	4.9	0.64	0.88	NA*
1996	4.5	0.20	0.84	0.63
1997	NA*	NA*	0.61	0.51

*** Data not available for these years.**

Figure 7 is a comparison graph of the LWCIR for CII owners, CII contractors, industry contractors, USACE, and NAVFAC. All show a downward trend over time. CII performance for the companies surveyed indicates less recordable incidents than the construction industry as a whole.

USACE and NAVFAC performance for 1996 and 1997 indicate more lost workdays than CII, but significantly less than the industry as a whole.

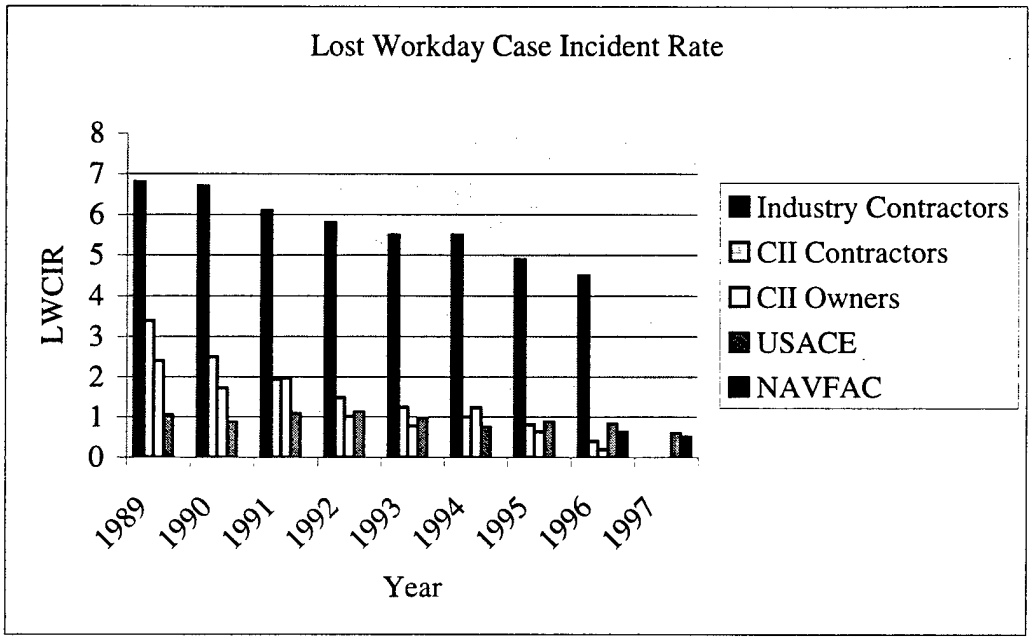


Figure 6. Lost Workday Case Incident Rate Comparison 1989 – 1997

The six NAVFAC owned projects, which were part of the CII Benchmarking and Metrics Completed Project Data: Owners (Version 2.0) survey, had no reported lost workday cases, recordable incidents, or fatalities. These projects shall be compared on the basis of safety best practice usage presented in the next section.

4.2 Benchmarking and Metrics Safety Data Presentation

The CII BM&M Completed Project Data (Version 2.0) Survey was sent to all CII Member Companies in 1995 to quantify the benefits of best practice implementation.

For this thesis the BM&M Survey responses were reviewed and only those who had answered the "safety practice" questions were included. Figure 7 shows the percentage breakdown of the projects analyzed. Eighty-nine owner, 68 contractor, and six NAVFAC projects were in the BM&M database.

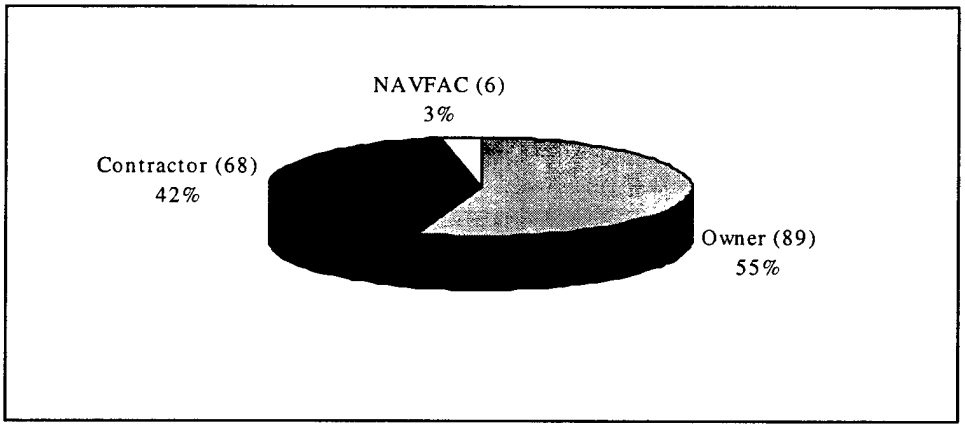


Figure 7. Distribution of Projects by the Type of Member

The owner survey responses from the CII BM&M Version 2.0 survey were indexed and their respective scores can be found in Table 10. Contractor survey responses can be found in Table 11. For both these tables, column (1) lists the CII project identification number, column (2) is the type of respondent, column (3) is the

project type, column (4) designates whether the respondent is a public or private entity, and column (5) is the practice use index score. When scanning the CII project identification numbers, note that the projects failing to answer the safety questions were omitted. The median for the owner respondents was 8.33 and the average was 7.76 and for the contractor respondents it was 8.13 and 6.19, respectively.

The NAVFAC survey responses from the CII BM&M Version 2.0 survey were indexed and their respective scores can be found in Table 9. For this table, column (1) lists the CII project identification number, column (2) is the type of respondent, column (3) is the project type, column (4) shows all five respondents were public entities, and column (5) is the practice use index score. Note that CII project number O195, the sixth NAVFAC project, was omitted because none of the safety questions were answered.

Table 9. CII NAVFAC Practice Use Index Scores

CII ID No. ID	Respondent Type	Type of Project Built	Public/ Private	Safety Index
O190	Owner	Maintenance Facilities	Public	3.13
O191	Owner	Highrise Office	Public	7.29
O192	Owner	Laboratory	Public	7.09
O193	Owner	Restaurant/Night club	Public	6.46
O194	Owner	Dormitory/Hotel	Public	8.33
			AVG	6.46

Table 10. CII Owner Practice Use Index Scores

CII ID No.	Respondent Type	Type of Project Built	Public/ Private	Safety Index
O1000	Owner	Oil Refining	Private	7.29
O103	Owner	Water/Wastewater	Private	9.79
O104	Owner	Laboratory	Private	8.13
O105	Owner	Oil Refining	Private	10.00
O106	Owner	Marine Facilities	Private	10.00
O107	Owner	Oil Refining	Private	10.00
O108	Owner	Environmental	Private	9.17
O109	Owner	Oil Refining	Private	10.00
O110	Owner	Metals Refining/Processing	Private	8.33
O111	Owner	Metals Refining/Processing	Private	9.18
O112	Owner	Metals Refining/Processing	Private	6.26
O113	Owner	Metals Refining/Processing	Private	8.54
O114	Owner	Chemical Mfg.	Private	5.63
O115	Owner	Chemical Mfg.	Private	10.00
O116	Owner	Chemical Mfg.	Private	10.00
O117	Owner	Chemical Mfg.	Private	10.00
O118	Owner	Chemical Mfg.	Private	6.04
O122	Owner	Pharmaceuticals Mfg.	Private	6.46
O123	Owner	Pharmaceuticals Mfg.	Private	9.38
O124	Owner	Pharmaceuticals Mfg.	Private	9.16
O125	Owner	Pharmaceuticals Mfg.	Private	7.71
O126	Owner	Pharmaceuticals Mfg.	Private	9.38
O127	Owner	Chemical Mfg.	Private	8.75
O128	Owner	Pharmaceuticals Mfg.	Private	6.88
O133	Owner	Metals Refining/Processing	Private	7.71
O134	Owner	Automotive Assembly	Private	7.08
O135	Owner	Automotive Assembly	Private	8.13
O136	Owner	Foods	Private	8.96
O137	Owner	Lowrise Office	Private	8.96
O138	Owner	Chemical Mfg.	Private	8.54
O139	Owner	Chemical Mfg.	Private	8.75
O140	Owner	Chemical Mfg.	Private	9.38

Table 10(Continued). CII Owner Practice Use Index Scores

CII ID No.	Respondent Type	Type of Project Built	Public/ Private	Safety Index
O141	Owner	Metals Refining/Processing	Private	6.04
O142	Owner	Chemical Mfg.	Private	9.38
O143	Owner	Chemical Mfg.	Private	9.79
O146	Owner	Oil Refining	Private	9.17
O147	Owner	Oil Refining	Private	9.79
O148	Owner	Oil Refining	Private	9.38
O150	Owner	Pulp and Paper	Private	9.38
O151	Owner	Pulp and Paper	Private	9.38
O152	Owner	Pulp and Paper	Private	2.29
O153	Owner	Pulp and Paper	Private	6.88
O154	Owner	Pulp and Paper	Private	7.29
O155	Owner	Electrical (Generating)	Private	9.79
O156	Owner	Water/Wastewater	Private	9.17
O157	Owner	Foods	Private	9.38
O158	Owner	Warehouse	Private	9.38
O159	Owner	Foods	Private	6.67
O160	Owner	Consumer Products Manufacturing	Private	9.38
O161	Owner	Foods	Private	7.29
O162	Owner	Consumer Products Manufacturing	Private	10.00
O163	Owner	Consumer Products Manufacturing	Private	9.38
O164	Owner	Chemical Mfg.	Private	8.75
O165	Owner	Oil Refining	Private	5.21
O166	Owner	Lowrise Office	Private	5.42
O167	Owner	Pharmaceuticals Mfg.	Private	6.88
O168	Owner	Chemical Mfg.	Private	7.92
O169	Owner	Chemical Mfg.	Private	8.13
O170	Owner	Chemical Mfg.	Private	7.29
O171	Owner	Chemical Mfg.	Private	2.50
O172	Owner	Oil Refining	Private	10.00
O173	Owner	Oil Refining	Private	0.00
O174	Owner	Oil Refining	Private	10.00

Table 10 (Continued). CII Owner Practice Use Index Scores

CII ID No.	Respondent Type	Type of Project Built	Public/ Private	Safety Index
O175	Owner	Water/Wastewater	Private	9.79
O176	Owner	Chemical Mfg.	Private	9.38
O177	Owner	Chemical Mfg.	Private	10.00
O178	Owner	Consumer Products Mfgr.	Private	9.38
O179	Owner	Water/Wastewater	Private	7.93
O180	Owner	Electrical Distribution	Private	6.88
O181	Owner	Water/Wastewater	Private	9.17
O182	Owner	Oil Refining	Private	6.46
O188	Owner	Chemical Mfg.	Private	10.00
O189	Owner	Oil Refining	Private	8.96
O196	Owner	Chemical Mfg.	Private	7.50
O119	Owner	Maintenance Facilities	Public	6.46
O120	Owner	Lowrise Office	Public	9.17
O121	Owner	Lowrise Office	Public	5.64
O129	Owner	Electrical (Generating)	Public	7.09
O130	Owner	Electrical (Generating)	Public	7.50
O131	Owner	Electrical (Generating)	Public	0.84
O132	Owner	Electrical (Generating)	Public	7.71
O144	Owner	Water/Wastewater	Public	6.04
O145	Owner	Lowrise Office	Public	6.67
O149	Owner	Electrical (Generating)	Public	6.67
O183	Owner	Hospital	Public	7.50
O184	Owner	School	Public	9.38
O185	Owner	School	Public	4.79
O186	Owner	School	Public	2.71
O187	Owner	School	Public	4.17
O190	Owner	Maintenance Facilities	Public	5.63
O191	Owner	Highrise Office	Public	7.29
O192	Owner	Laboratory	Public	7.09
O193	Owner	Restaurant/Nightclub	Public	6.46
O194	Owner	Dormitory/Hotel	Public	8.33
O195	Owner	Dormitory/Hotel	Public	0.00
			Median	8.33
			Average	7.76

Table 11. CII Contractor Practice Use Index Scores

CII ID No.	Respondent Type	Type of Project Built	Public/ Private	Safety Index
C1000	Contractor	Chemical Mfg.	Private	8.76
C127	Contractor	Pulp and Paper	Private	7.92
C128	Contractor	Pulp and Paper	Private	9.38
C129	Contractor	Consumer Products Mfg.	Private	8.34
C130	Contractor	Chemical Mfg.	Private	7.92
C131	Contractor	Chemical Mfg.	Private	9.18
C135	Contractor	Oil Exploration/Production	Private	7.92
C137	Contractor	Oil Refining	Private	10.00
C138	Contractor	Oil Refining	Private	8.54
C139	Contractor	Consumer Products Mfg.	Private	6.88
C141	Contractor	Electrical (Generating)	Private	9.38
C143	Contractor	Consumer Products Mfg.	Private	6.25
C144	Contractor	Water/Wastewater	Private	9.17
C145	Contractor	Foods	Private	9.38
C146	Contractor	Electrical (Generating)	Private	6.66
C147	Contractor	Pulp and Paper	Private	10.00
C148	Contractor	Pulp and Paper	Private	10.00
C149	Contractor	Environmental	Private	8.76
C150	Contractor	Pulp and Paper	Private	9.38
C151	Contractor	Chemical Mfg.	Private	10.00
C152	Contractor	Pulp and Paper	Private	9.38
C153	Contractor	Pulp and Paper	Private	10.00
C155	Contractor	Pulp and Paper	Private	5.63
C156	Contractor	Other	Private	9.17
C157	Contractor	Chemical Mfg.	Private	10.00
C159	Contractor	Chemical Mfg.	Private	9.79
C160	Contractor	Chemical Mfg.	Private	9.79
C162	Contractor	Oil Refining	Private	8.13
C163	Contractor	Chemical Mfg.	Private	10.00
C166	Contractor	Chemical Mfg.	Private	9.58
C169	Contractor	Chemical Mfg.	Private	10.00
C172	Contractor	Oil Refining	Private	9.38
C174	Contractor	Pulp and Paper	Private	8.96
C175	Contractor	Pulp and Paper	Private	9.17
C176	Contractor	Chemical Mfg.	Private	10.00

Table 11(Continued). CII Contractor Practice Use Index Scores

CII ID No.	Respondent Type	Type of Project Built	Public/ Private	Safety Index
C177	Contractor	Warehouse	Private	8.13
C178	Contractor	Office Products Mfg.	Private	9.38
C179	Contractor	Chemical Mfg.	Private	9.38
C180	Contractor	Environmental	Private	6.46
C181	Contractor	Oil Refining	Private	9.17
C182	Contractor	Chemical Mfg.	Private	7.29
C185	Contractor	Electrical (Generating)	Private	9.17
C186	Contractor	Electrical (Generating)	Private	9.38
C187	Contractor	Chemical Mfg.	Private	9.79
C188	Contractor	Foods	Private	8.75
C189	Contractor	Rail	Private	7.92
C190	Contractor	Flood Control	Private	6.67
C191	Contractor	Oil Refining	Private	10.00
C192	Contractor	Chemical Mfg.	Private	10.00
C193	Contractor	Chemical Mfg.	Private	10.00
C195	Contractor	Oil Refining	Private	10.00
C200	Contractor	Chemical Mfg.	Private	10.00
C205	Contractor	Natural Gas Processing	Private	7.71
C206	Contractor	Oil Refining	Private	8.13
C207	Contractor	Oil Refining	Private	8.13
C208	Contractor	Chemical Mfg.	Private	8.75
C209	Contractor	Oil Refining	Private	8.13
C210	Contractor	Oil Refining	Private	8.13
C211	Contractor	Chemical Mfg.	Private	8.75
C214	Contractor	Chemical Mfg.	Private	10.00
C216	Contractor	Chemical Mfg.	Private	9.38
C217	Contractor	Natural Gas Processing	Private	6.88
C218	Contractor	Metals Refining/Processing	Private	9.38
C219	Contractor	Retail Building	Private	7.71
C220	Contractor	Hospital	Private	7.92
C183	Contractor	Highway	Public	8.13
C184	Contractor	Highway	Public	8.13
			Median	8.13
			Average	6.48

4.3 Additional NAVFAC Project Data

To increase the body of data available on NAVFAC projects, additional surveys were distributed to several former ROICC project managers who are now enrolled in the University of Texas at Austin Civil Engineering Project Management Program. Their responses offered data to determine if the five CII NAVFAC projects fairly represented the Navy as a whole. Eighteen responses were received and the information is presented in Table 12. Column (1) is the project identification number. Note that the number corresponds to the engineering field division where the job was constructed. "SDIV" is Southern Division, "NDIV" is Northern Division, "WDIV" is Western Division, and "LDIV" is Atlantic Division. Column (2) is the type of project. Column (3) lists the answers to all of the safety practice questions. Questions 10 through 25 are from the "U.S. Navy Benchmarking and Metrics Questionnaire" and the other number corresponds to questions 19 through 34 on the "CII Benchmarking and Metrics Questionnaire." The first eight questions were based on a "Yes/No/Not Applicable" construct. The next eight questions used an ordinal treatment of "Always/ Sometimes/Seldom/Never." Answers to these questions are numerical; 1 is "always," 2 is "sometimes," 3 is "seldom," and 4 is "never." Column (4) is the indexed safety score (see Chapter 3.0 for an explanation of indexing). The average safety performance for the sample is 6.26 and the median is 6.26.

Table 12. Safety Practice Use Scores for Additional NAVFAC Projects

(1)ID No.	(2) Type of Project Built	(3) Safety Practice Question Number																(4) Safety Index
		10 / 19	11/ 20	12/ 21	13/ 22	14/ 23	15/ 24	16/ 25	17/ 26	18/ 27	19/ 28	20/ 29	21/ 30	22/ 31	23/ 32	24/ 33	25/ 34	
SDIV-01	Aircraft Hanger	Y	Y	Y	Y	N	N	N	N	1	1	1	1	.67	0	.33	.67	6.04
SDIV-02	Flight Simulator	Y	Y	Y	Y	N	N	N	N	1	1	1	1	.67	0	.33	.67	6.04
SDIV-03	Air Control Tower	Y	Y	Y	Y	N	N	N	N	.33	.67	.33	1	.67	.67	.67	.67	5.63
SDIV-04	Marine Facilities	Y	Y	Y	N	N	Y	Y	N	1	1	1	1	1	0	1	1	7.50
SDIV-05	Rail Crane	Y	Y	Y	N	Y	Y	Y	N	1	1	.67	1	1	0	.67	1	7.71
SDIV-06	Fuel Tanks	Y	Y	Y	N	N	Y	Y	N	1	1	.67	0	1	0	.67	.67	6.26
SDIV-07	Barracks/BEQ	Y	Y	Y	N	N	Y	Y	N	1	1	1	1	1	0	.67	.33	6.88
SDIV-08	Barracks/BOQ	Y	Y	Y	N	N	Y	Y	Y	1	1	1	1	1	0	.33	.67	7.50
SDIV-09	Fuel Tanks & Pipes	Y	Y	Y	N	N	Y	Y	Y	1	1	1	1	1	.33	1	1	8.33
WDIV-01	Electrical Distrib.	Y	N	Y	N	N	Y	N	N	1	1	.67	1	.67	0	1	1	5.84
WDIV-02	Water/ Wastewater	Y	N	Y	N	N	Y	N	N	1	1	0	1	.67	0	.33	.67	4.79
WDIV-03	Water/ Wastewater	Y	N	Y	N	N	Y	N	N	1	1	0	1	.67	0	.33	.67	4.79
SWDIV-1	Pistol/ Rifle Range	Y	Y	Y	N	N	Y	Y	Y	0	1	0	1	1	0	1	1	6.88
LDIV-01	Renovate Housing	Y	Y	Y	N	N	Y	N	N	0	.67	.33	.67	.67	0	.67	.67	4.80
NDIV-01	Hotel Renovation	Y	N	Y	N	N	Y	N	N	1	1	1	1	.33	0	.67	.33	5.21
NDIV-02	Pier Replacement	Y	N	Y	N	N	Y	N	N	1	1	1	1	.67	0	1	.67	5.84
NDIV-03	Replace Quaywall	Y	Y	Y	N	N	Y	N	N	0	1	.67	1	.67	0	.67	.67	5.43
NDIV-04	Utilities Upgrade	Y	Y	Y	N	N	Y	N	N	1	1	1	1	.67	0	.67	.67	6.26
O190	Maintenance Fac.	Y	Y	N	N	N	Y	Unk	Unk	1	1	1	1	.67	0	.67	.67	3.13
O191	Highrise Office	Y	Y	Y	Y	N	Y	N	N	0	1	1	1	1	.67	1	1	7.29
O192	Laboratory	Y	Y	Y	Y	N	Y	N	N	0	1	.67	1	1	.67	1	1	7.09
O193	Restaurant/Club	Y	Y	Y	N	N	Y	N	N	0	1	1	1	1	.67	1	.67	6.46
O194	Dormitory/Hotel	Y	Y	Y	Y	Y	Y	Y	Y	0	1	.33	1	1	.33	.67	1	8.33
															Med	6.26	**Avg**	6.26

5. Analysis of Data

Section 5.2 of this Chapter outlines the effects of Safety (Zero Accidents) practice use on Safety performance as measured by the RIR and LWCIR. The other sections provide an analysis of NAVFAC safety practice use as it compares to CII.

5.1 Determining Quartile Comparisons

Use of a graphic tool called the "box and whisker plot" or the "quartile plot" allows display of the "spread" of data. The plot consists of six different pieces of information. Figure 8 shows these six pieces and how to interpret them.

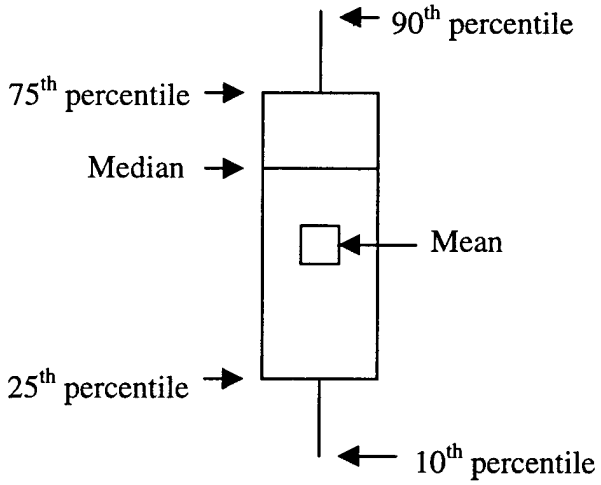


Figure 8. Box and Whisker (Quartile) Plot Legend

5.2 Relating Safety Practice Use to Safety Incident Rates

Figure 9 represents a CII analysis of the effects of Safety (Zero Accidents) practice use on Safety performance as measured by the RIR. The sample of projects included all projects submitted by owners and contractors to date that provided complete safety practice use and safety performance data. Those that used safety practices to a higher degree experienced a much lower average RIR and less variation in RIR. Fifty percent of the projects represented in the 4th quartile experienced a RIR in excess of 4.5 with an average RIR value of approximately 8.0. Seventy-five percent of the projects in the 1st quartile experienced an RIR of less than 3.0 with an average value of 3.0.

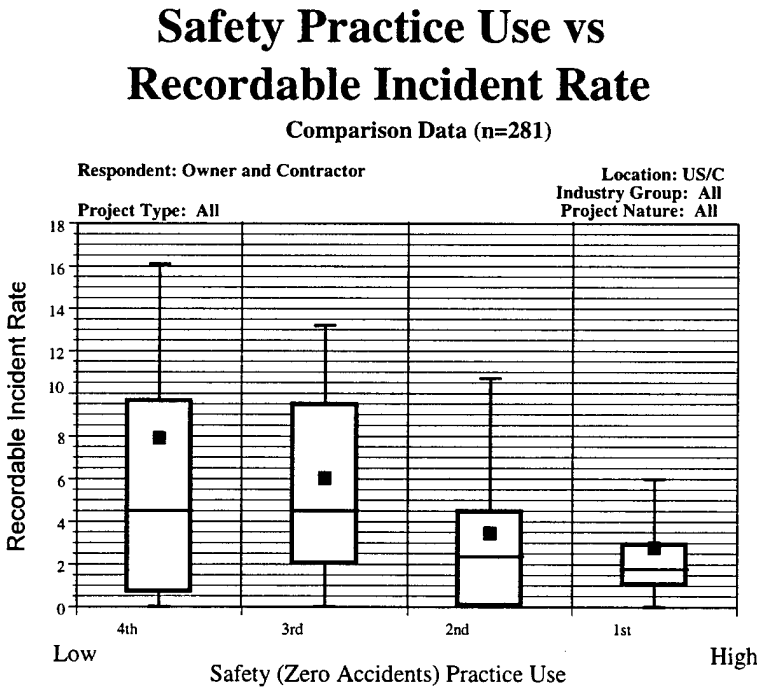


Figure 9. Safety Practice Use Versus RIR

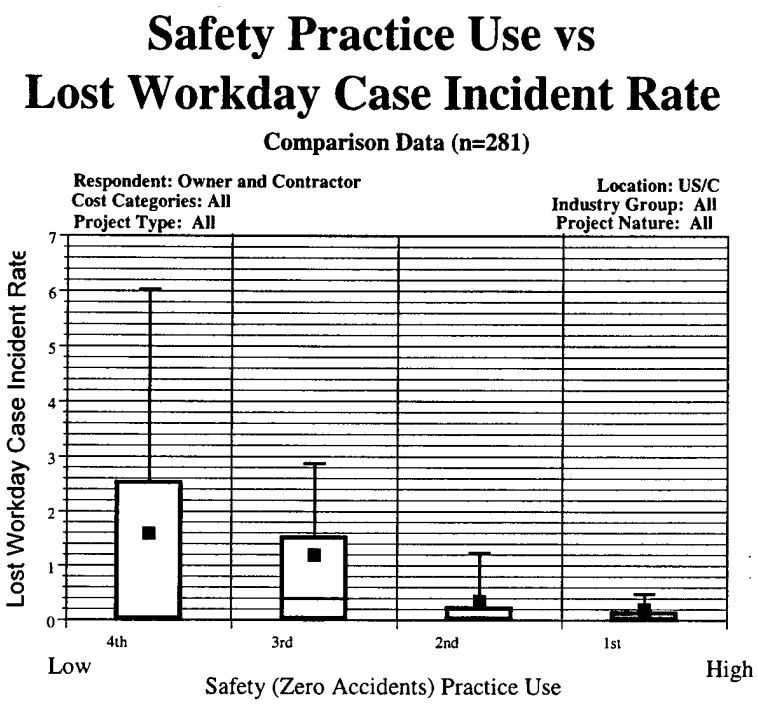


Figure 10. Safety Practice Use Versus LWCIR

Figure 10 represents an analysis of the effects of safety practice use on performance as measured by the LWCIR. As expected, the results of this analysis are very similar in nature to those described above concerning RIR because of the correlation between RIR and LWCIR values. Approximately 90% of the projects in the highest safety use quartile reported LWCIR values of less than 0.5.

5.3 Comparison of CII Owners and NAVFAC

Figure 11 is a "box and whisker" (or quartile) plot comparing CII safety best practice use with that of the five NAVFAC projects in the BM&M database (CII ID Nos. O190 through O194) who answered the safety practice questions.

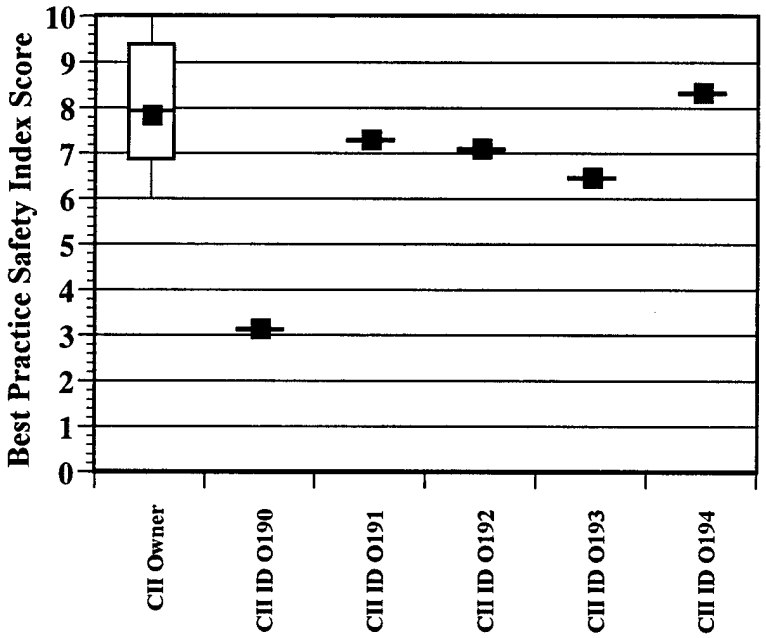


Figure 11. Quartile Plot of Best Practice Safety Use

For this rather small body of NAVFAC data, "O194" is in the 2nd quartile of the CII data, while projects "O191" and "O192" are in the 3rd quartile and projects "O190" and "O193" are in the 4th quartile. Because of the small number of NAVFAC projects surveyed, the collection of additional data was merited.

5.4 Additional NAVFAC Project Data Analysis

Data on an additional 18 NAVFAC projects was collected using the Navy Safety Practice Survey. Unfortunately, none of the responses included answers to the questions regarding the number of lost workdays or the number of recordable incidents, because NAVFAC has only recently begun to collect this data. However, the safety practice survey questions were answered and Figure 12 is a quartile plot of this body of data as it compares to the five projects in the BM&M database.

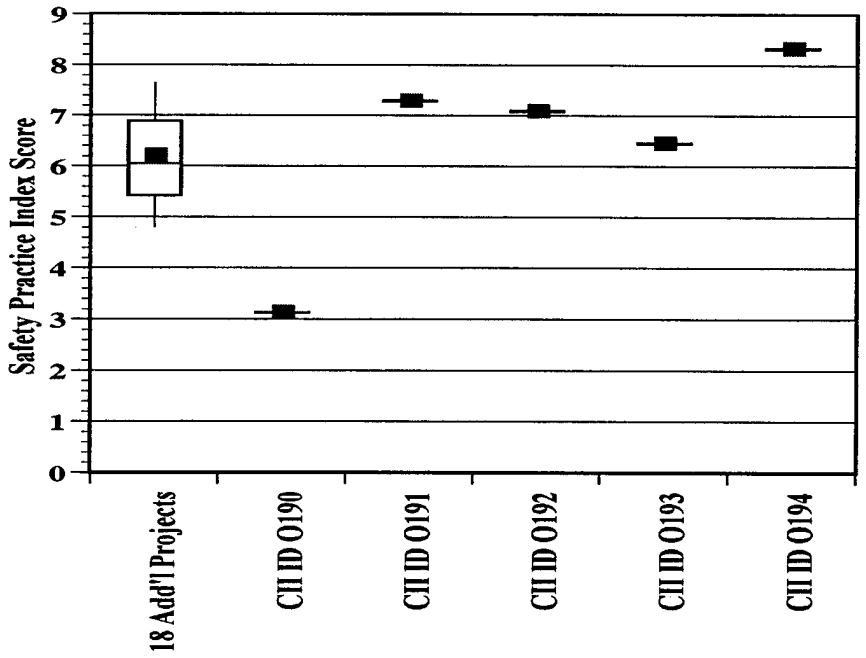


Figure 12. Additional NAVFAC Project Data Compared to BM&M Projects

In Figure 12, with the exception of CII ID O190, the NAVFAC projects in the BM&M database are in the first or second quartile when compared to the 18 sampled NAVFAC projects. This larger sample of projects shows safety best practice usage that is very similar to projects O190 through O194; thus supporting the fact that the NAVFAC BM&M projects accurately represent NAVFAC safety best practice usage as a whole.

Figure 13 is a quartile comparison plot of all 23 NAVFAC projects and the CII Owner projects from the BM&M database. The 90th percentile of the 23 NAVFAC projects is approximately equivalent to the average score for CII Owner projects. NAVFAC's average falls in the lower 25 percent of the CII Owner projects. This relative measure of NAVFAC safety practice illustrates that, for the 23 projects analyzed, NAVFAC does not use safety best practices as frequently as the CII Owner companies did on their 89 projects surveyed.

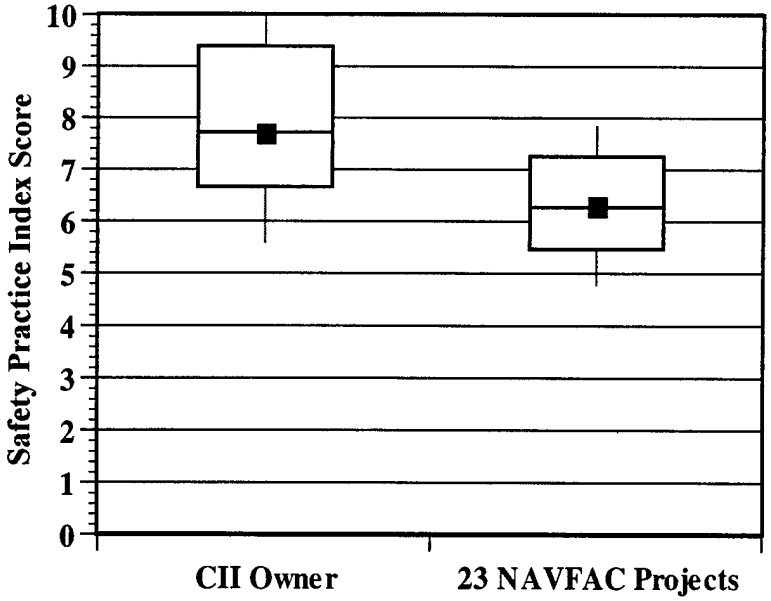


Figure 13. Quartile Comparison of NAVFAC versus CII Owners

Detailed review of the individual Navy Safety Practice questionnaires reveals infrequent use of several practices (see Table 12 in Chapter 4). The majority of NAVFAC projects surveyed had negative responses to questions 13, 14, 17, and 23. Figure 14 shows the frequency of affirmative responses to question number 13 (22 on the BM&M survey). Over 60 percent of CII owners indicate that a full-time safety supervisor is assigned to their projects. Only 25 percent of NAVFAC projects queried indicated that the site safety supervisor was full-time. The NAVFAC guide specification states "...The superintendent or other qualified or competent person who is responsible for on-site safety..." shall be the designated "Safety Officer." While the specifications require that this individual be able to "...manage the on-site contractor safety program through appropriate management controls..." it does not specifically require a full-time supervisor. The project superintendent can perform these duties in addition to his own as long as he meets the qualifications found in Section 1.5.1 of the Navy guide specification (see Appendix B).

Figure 15 shows the frequency of affirmative response to question number 14 (23 on the BM&M survey). Over 35 percent of the CII owners include written safety incentive programs in their projects. NAVFAC infrequently includes these incentives, but in public contracting it is often difficult to justify such an expense.

However, extensive research by the CII Zero Injury Task Force has shown that inclusion of such a program has a positive impact on project safety and,

furthermore, this is one of the top five best practices which will result in "excellent" safety performance (see Table 1 on page 10).

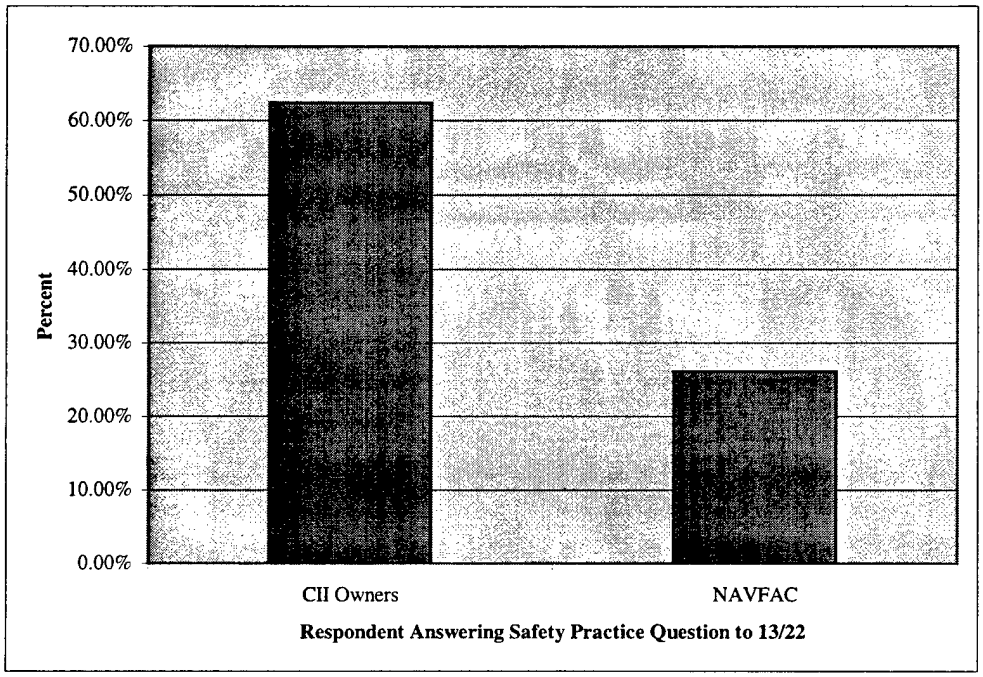


Figure 14. Frequency of Full-time Site Safety Supervisor Assignment

Incentives can take many forms. Usually the bigger construction projects find it beneficial to use worker incentives; some companies have used non-financial items such as lunches and special ball caps.

Figure 16 shows the frequency of affirmative response to question number 17 (26 on the BM&M survey). Over 50 percent of CII owners responded that their contractor employees were randomly screened for alcohol and drugs.

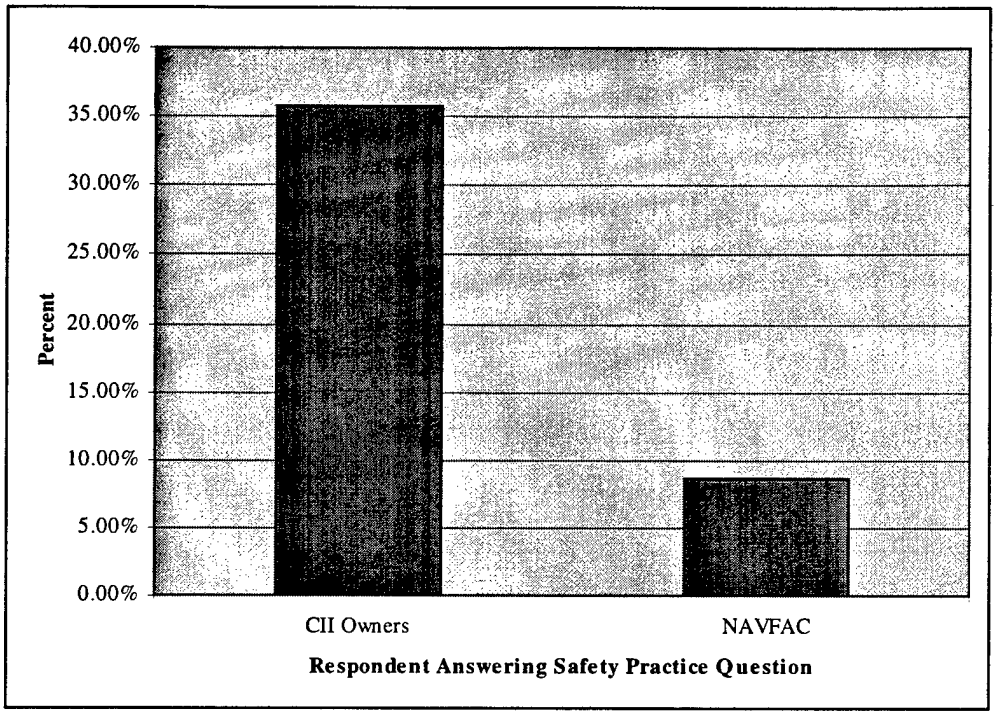


Figure 15. Frequency of Safety Incentive Programs (Question 14/ 23)

Only 18 percent of the NAVFAC projects questioned showed that their contractor employees were randomly screened for alcohol and drugs.

Research by the CII Zero Injury Task Force has shown that emphasis on a comprehensive drug and alcohol screening program has a positive impact on project safety and is one of the top five best practices which will result in "excellent" safety performance (see Table 1 on page 10). The most current NAVFAC guide specification requires contractors to "...Describe (a) plan for random checks and testing with pre-employment screening in accordance with the Defense Acquisition Federal Regulations (DFAR) Clause subpart 252.223-7004..." Responses to the

safety practice questions indicate no such program exists or the program is not visible enough for the owner's representative to take notice.

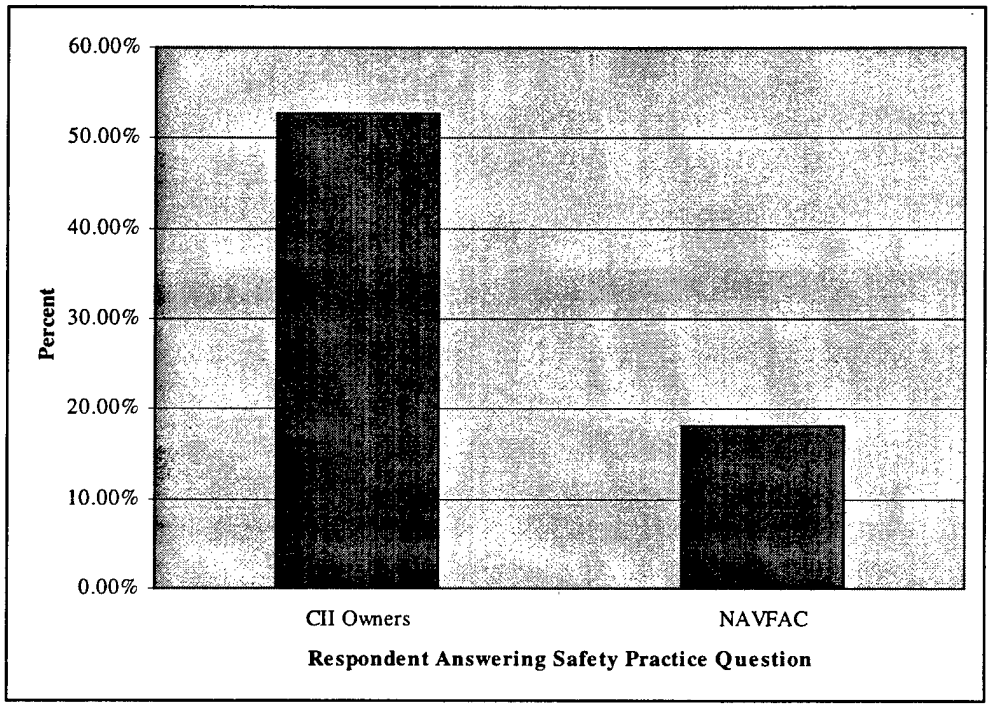


Figure 16. Frequency of Required Alcohol and Drug Abuse Plan (Question 17/26)

Figure 17 shows the frequency of affirmative responses to question number 23 (26 on the BM&M survey). A cursory look shows that over 70 percent of the CII owners surveyed in the BM&M questionnaire use safety records as a criterion for contractor/subcontractor selection. For the body of NAVFAC projects sampled this criterion is used with a frequency of only a little over 10 percent for the projects surveyed. Four out of five of the NAVFAC projects in the CII database indicated

some use of safety criterion for contractor selection. This accounts for all but two positive responses on this question for the NAVFAC projects surveyed.

NAVFAC has directed field offices to begin using safety for contractor selection criterion as of December 1997 (see Appendix J). These efforts should result in NAVFAC contracting with contractors that have increased safety awareness.

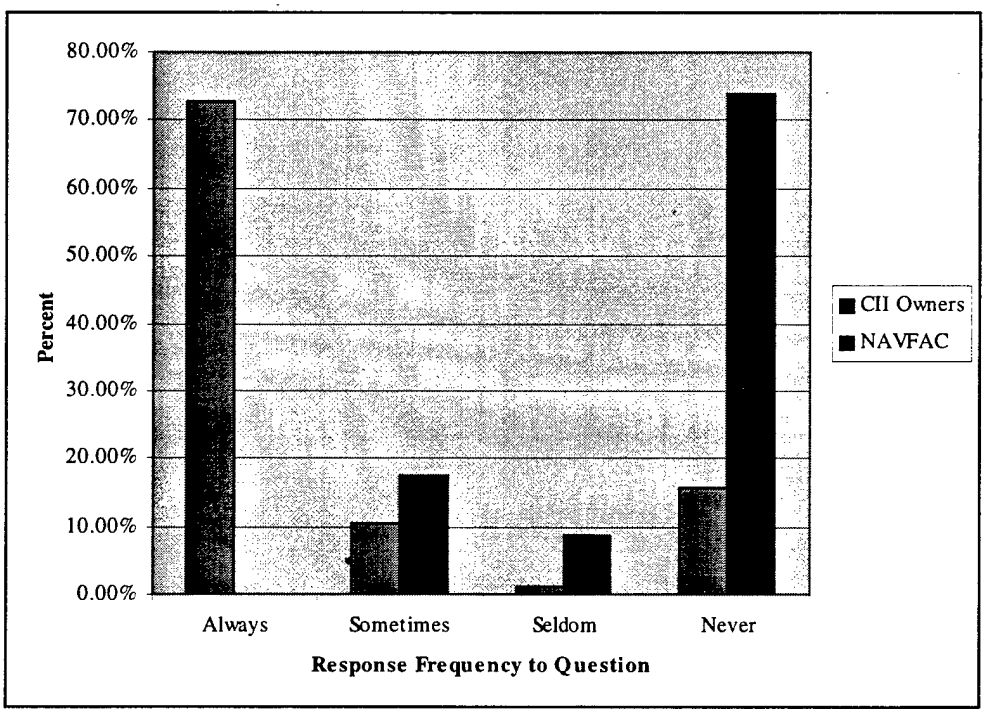


Figure 17. Frequency of Affirmative responses to Question 23/32

Studies indicate that it is not uncommon for contractors with poor safety records to pay twice the workman's compensation premium cost of those with excellent safety records (Liska 1993). Basing pre-qualification on the contractor's

past safety record can be an economically sound decision and should be reemphasized to all field offices.

6. Conclusions

NAVFAC's contractor safety program appears to be successful and the continued enforcement of several new guide specification requirements, such as the Drug and Alcohol Abuse Plan, will only improve contractor safety. As more emphasis is placed on contractor safety records and a large database of quarterly safety statistics is gathered, the safety performance can be expected to steadily improve.

The data collected by the author indicates that NAVFAC projects generally perform at a safer level greater than the United States construction industry, but at a lower safety performance level than the average member companies of CII. With the extensive research performed by CII in the area of best practice use in the construction industry, many lessons can be learned and applied to future NAVFAC projects. Specific conclusions are as follows:

- CII member companies have less lost workdays than the construction industry as a whole based upon a lower LWCIR from 1989 to 1996
- CII member companies have less recordable incidents on their construction projects, based upon RIR from 1989 to 1996.
- CII member companies had less lost workdays than NAVFAC in 1996. This was the only comparison year where quantitative data on LWCIR was available for NAVFAC. In 1996, NAVFAC started an initiative to

collect quarterly safety statistics from all their contractors. In the future, this effort should allow a more thorough examination of where NAVFAC stands in relation to the rest of the industry.

- A surprising outcome came from the data collected from NAVFAC for 1996 and 1997. The U.S. Army Corps of Engineers LWCIR for 1989 through 1996 was very low and comparable to CII. In fact, the USACE LWCIR was lower than CII owners and contractors for 1989 to 1991 and 1994. And for 1992 and 1993 USACE LWCIR was lower than the CII owner's average.
- On average, for the data reviewed, CII owners showed more frequent use of the safety best practices than the five NAVFAC projects in the BM&M database.
- Eighteen responses to additional NAVFAC questionnaires showed that, for the projects submitted, the safety best practices were used more infrequently than on most CII projects. This information supported the conclusion regarding the five NAVFAC projects in the BM&M database. Of the sixteen safety best practice questions answered, NAVFAC had high negative responses to four of them. All four were practices that CII classified as high-impact zero injury techniques.
- Extensive CII research by the Zero Injury Task Force has proven that the following five techniques significantly impact safety on the construction

project: (1) Safety pre-project/pre-task planning, (2) Safety orientation and training, (3) Written safety incentive program, (4) Alcohol and substance abuse program, and (5) Accident/Incident investigation. In many cases, use of these techniques meant the defining difference between "good in safety" and "excellent in safety."

- Even though there is a close correlation between RIR and LWCIR values, these numbers must be tracked separately. The NAVFAC Facility Safety and Health Office does not track both of these rates.

NAVFAC executes millions of workhours of construction each year. Even though the small amount of quantitative data in this report shows that NAVFAC, on average, is safer than the nationwide construction industry, it also shows that the member companies of CII have a better safety record. Increased use of several safety best practices shows promise for increased safety on NAVFAC construction projects.

7. Recommendations

7.1 Actions Based on Analysis of Research

The results of this study indicate that NAVFAC projects are safer than the construction industry as a whole, but when compared to the membership of CII there is room for improvement. The following recommendations are based on analysis of 23 projects and offered to further NAVFAC efforts to improve contractor safety performance:

- The inclusion of a specification requirement for the contractor to assign a full-time safety supervisor on large projects where numerous planned workhours are anticipated can have a significant impact on project safety. This is a sub-element of the "number one" high impact zero injury technique recommended by the CII Zero Accidents Task Force (see Table 1 in Chapter 2).
- The requirement for a contractor to include a written safety incentive program can have a significant positive impact on project safety. When workers know that "their incentive pay" is on the line, they will strive to conduct safer construction activities. The CII Zero Injury Task Force recommends the safety incentive program as the "number three" high

impact zero injury technique (see Table 1 in Chapter 2). Inclusion of such a program has a positive impact on project safety and often means the difference between a contractor who is "good in safety" and one who is "excellent in safety."

- NAVFAC should strictly enforce the requirement for contractors and subcontractors to make random drug and alcohol checks and to conduct pre-employment screening in accordance with the DFAR Clause subpart 252.223-7004. The guide specification should require the contractor to report completion of a routine random check and, at the beginning of the project, certify that pre-employment screening has been done. This is the "number 4" recommendation of the CII Zero Accidents Task Force.
- NAVFAC should reemphasize to the field offices the importance of using safety criterion for contractor selection. A Sample Contractor Safety Evaluation Questionnaire can be found in Appendix C and could be modified as necessary. This simple questionnaire can be completed and submitted at bid opening as part of the requirement in Appendix I.
- NAVFAC should continue to collect quarterly safety data from their contractors and strive to compare performance to the rest of the industry. Since NAVFAC is a member of CII, further comparison of safety performance to other CII companies is encouraged.

- NAVFAC should use CII literature outlining proven research in the area of improved safety performance as part of U.S. Navy contracting classes such as the Basic Civil Engineer Corps Officer's School.
- NAVFAC should make efforts to capture both LWCIR and RIR when collecting quarterly safety information from their contractors. Both of these items should be compared to CII and the construction industry to best measure NAVFAC's relative safety performance.

7.2 Recommendations for Future Research

This study only considered the five CII projects from the BM&M survey and the eighteen additional projects surveyed for this thesis. Considering the large number of projects undertaken by NAVFAC each year, it is recommended that other comparisons be made as quarterly data are submitted. Other recommendations for future research include:

- Survey all projects to determine best practice use throughout the entire Navy construction program. This form can be submitted as part of the final project documentation. Since some contractors may be unwilling to complete a survey form, at the very least those contracts being partnered can be surveyed.

- Initial examination of statistical data on the U.S. Army Corps of Engineer's LWCIR for 1989 to 1996 shows a consistently excellent record of construction safety. Research into the USACE safety practices could provide more methods to increase safety on NAVFAC projects.

APPENDICES

Appendix A: Excerpt from NAVOSH Program Manual

CHAPTER 2

RESPONSIBILITIES

0201. Discussion

a. The maintenance of a safe and healthful workplace is a responsibility of command throughout the Navy. A successful Navy Occupational Safety and Health (NAVOSH) program, one which truly reduces work-related risks and mishaps, results only when support and commitment to the program permeates every level of an organization. Within the Navy, overall responsibility for the NAVOSH Program is vested in the Chief of Naval Operations (CNO) and the program is implemented through the chain of command. Maintenance of safe and healthful working conditions is a line management responsibility. The NAVOSH program is an integral part of the Navy's Total Quality Leadership (TQL) Program.

b. This chapter describes the responsibilities at each command level for implementing the NAVOSH Program.

0202. Assistant Secretary of the Navy (Installations and Environment (ASN(I&E)). ASN(I&E) is the designated safety and occupational health official for the Department of the Navy (DON) which includes the Navy and Marine Corps.

0203. Chief of Naval Operations (CNO). Under reference 2-1, the CNO, in coordination with the Commandant of the Marine Corps (CMC) with respect to matters of mutual concern, shall:

a. Issue appropriate directives and policies to be implemented by all commands, activities and personnel, under reference 2-2.

b. Establish appropriate planning, programming, staffing, and budgeting for NAVOSH Program implementation

c. Issue criteria for records maintenance and provide to the Secretary of the Navy (SECNAV) all reports required by references 2-3 through 2-10. These criteria shall ensure:

(1) The development of reporting and recording procedures to provide meaningful statistics concerning accidents, injuries, and occupational illnesses in order to evaluate the effectiveness of the programs.

(2) A register of personnel occupationally exposed to chemical substances and other hazardous physical or biological stresses, as deemed appropriate by the Bureau of Medicine and Surgery (BUMED), is maintained.

(3) Employees, or their designated representatives, have access to workplace records regarding individual exposures.

(4) Medical records are maintained, upon termination of employment, per references 2-5 and 2-6.

(5) Workplace monitoring and survey records for shore activities are kept for 50 years, per references 2-5 and 2-6.

Appendix B: NAVFAC Safety Guide Specification

DEPARTMENT OF THE NAVY
NAVAL FACILITIES
ENGINEERING COMMAND
GUIDE SPECIFICATION

NFGS-01525C
30 September 1997

Superseding NFGS-01525B (12/96)

SECTION TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01525

SAFETY REQUIREMENTS

09/97

DEPARTMENT OF THE NAVY
NAVAL FACILITIES
ENGINEERING COMMAND
GUIDE SPECIFICATION

NFGS-01525C
30 September 1997

Superseding NFGS-01525B (12/96)

NFGS-01525C

SAFETY REQUIREMENTS

Preparing Activity: NAVFACENGCOMHQ (CODE 40K)

	Typed Name & Reg.	Signature	Date
Prepared by:	Craig Schilder, P.E., CSP Division Director NAVFAC Safety & Health	/s/	08/06/97
Approved for NAVFAC:	Carl E. Kersten, R.A.	/s/	09/30/97

AMSC N/A

AREA FACR

SECTION 01525

SAFETY REQUIREMENTS
09/97

NOTE: This guide specification covers construction safety requirements and requirements for the protection of Government people, property and resources. It is intended for use in construction, renovation and demolition projects in the continental U.S. and overseas. The requirements of the guide specification supplement Army Corps of Engineers manual EM-385-1-1 and clarify safety concerns for high risk construction activities. All contracts require an Accident prevention Plan with associated Activity Hazard Analysis (and related specific plans, programs, procedures) listed on pages A-3 and A-4 per COE EM-385-1-1. Some contracts may require additional special safety plans which should be included with respective sections of the specifications. For environmental remediation contracts, an APP is required with the overall contract and a site specific Health and Safety Plan is required for each task order. Contact the EFD/EFA Safety Manager for applicability. Many states and municipalities have more stringent or additional requirements and this section should be modified as required to suit local conditions and regulations.

NOTE: This revision "C" to NFGS-01525 follows a complete review of the previous version. The text is revised throughout, according to that review.

PART 1 GENERAL

1.1 SUMMARY

1.1.1 Related Sections

a. Section 01310, "Administrative Requirements"

b. Section 01500, "Temporary Facilities and Controls"

[c. Section 13283, "Removal and Disposal of Lead-Containing Paint"]

[d. Section 13281, "Engineering Control of Asbestos Containing Materials"]

[e. Section 02220, "Site Demolition"]

[f. Section 02302, "Excavation, Backfilling, and Compacting for Utilities"]

[g. Section 02315, "Excavation and Fill"]

h. Section 03100, "Concrete Form and Accessories"

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A10.14	(1991) Construction and Demolition Operations - Requirements for Safety Belts, Harnesses, Lanyards and Lifelines for Construction and Demolition Use
ANSI Z359.1	(1992) Safety Requirements for Personal Fall Arrest Systems

CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1910.94	Ventilation
29 CFR 1910.120	Hazardous Waste Operations and Emergency Response
29 CFR 1926.65	Hazardous Waste Operations and Emergency Response
29 CFR 1926.502(f)	Warning Line Systems

CORPS OF ENGINEERS (COE)

COE EM-385-1-1	(1996) Safety and Health Requirements Manual

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(1996) National Electric Code
NFPA 241	(1996) Safeguarding Construction, Alteration, and Demolition Operations

1.3 DEFINITIONS

[a. Certified Industrial Hygienist. An industrial hygienist is an individual who is certified by the American Board of Industrial Hygiene.]

[b. Certified Safety Professional. A safety manager, safety specialist, or safety engineer that has passed the CSP exam administered by the Board of Certified Safety Professionals.]

c. Confined Space. A space which by design has limited openings for entry and exit, unfavorable natural ventilation which could contain or produce dangerous air contaminants, and which is not intended for continuous employee occupancy, engulfment or any other recognized safety or health hazard. Confined spaces include, but are not limited to storage tanks, process vessels, pits, silos, vats, degreasers, reaction vessels, boilers, ventilation and exhaust ducts, sewers, tunnels, underground utility vaults, and pipelines.

d. Multi-employer work site (MEWS). The prime contractor is the "controlling authority" for all work site safety and health of the subcontractors.

e. Recordable Occupational Injuries or Illness. An occupational injury or illnesses which result in serious injuries, lost workday cases, non-fatal cases or significant mishaps.

f. Serious Injuries & Fatalities. Regardless of the time between the injury and death or the length of the illness; hospitalization of three or more employees; or property damage in excess of $200,000.

g. Lost Workday Cases. Injuries, other than fatalities, that result in lost workdays.

h. Non-Fatal Cases. Cases without lost workdays which result in transfer to another job or termination of employment, or require medical treatment (other than first aid) or involve property damage in excess of $10,000 but less than $200,000 or involve: loss of consciousness or restriction of work or motion. This category also includes any diagnosed occupational illnesses which are reported to the employer but are not classified as facilities or lost workday cases.

i. Health and Safety Plan (HASP). The HASP is the Navy equivalent Army term of SHP or SSHP used in COE EM-385-1-1. "USACE" property and equipment specified in COE EM-385-1-1 should be interpreted as Government property and equipment.

j. Safety Officer. The superintendent or other qualified or competent person who is responsible for the on-site safety required for the project. The contractor quality control person cannot be the safety officer, even through the QC has safety inspection responsibilities as part of the QC duties.

k. Significant Contractor Mishap. A contractor mishap which involves falls of 1200 mm 4 feet or more, electrical mishaps, confined space mishaps, diving mishaps, equipment mishaps, and fire mishaps which result in a lost time injury, or property damage of $10,000 or more, but less than $200,000; or when fire department or emergency medical treatment (EMT) assistance is required.

l. Medical Treatment. Treatment administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does not include first aid treatment provided by a physician or registered personnel.

m. First Aid. A one-time treatment, and follow-up visit for the purpose of observation, of minor scratches, cuts, burns, splinters, and so forth, which do not ordinarily require medical

care, even though provided by a physician or registered professional personnel.

n. Lost Workdays. The number of days (consecutive or not) after, but not including, the day of injury or illness during which the employee would have worked but could not do so; that is, could not perform all or part of his normal assignment during all or any part of the workday or shift; because of the occupational injury or illness.

1.4 SUBMITTALS

****

NOTE: The "G" in asterisk tokens following each submittal item indicates Government approval and should be retained. Add "G" in asterisk tokens following any added submittals that are determined to require Government approval. Submittal items not designated with a "G" will be approved by the QC organization.

****

Submit the following in accordance with section entitled "Submittal Procedures."

1.4.1 SD-08, Statements

a. Accident prevention plan (APP) G

b. Activity Hazard Analysis (AHA) G

c. Health and Safety Plan (HASP) G

1.4.1.1 Accident Prevention Plan (APP)

Submit at least 15 calendar days prior to start of work at the job site, follow Appendix A of COE EM-385-1-1, make APP site specific, Notice To Proceed will be given after Government finds the APP acceptable.

1.4.1.2 Activity Hazard Analysis (AHA)

Submit the AHA for the preparatory phase as a part of the APP. Submit subsequent AHA for each major phase of work at least 15 calendar days prior to the start of that phase. Format subsequent AHA as amendments to the APP.

1.4.1.3 [Health and Safety Plan (HASP)

Allow 30 calendar days for review by Naval Environmental Health Center for health hazard review and Naval Facilities Engineering Command, Engineering Field Division (EFD) or Engineering Field Activity (EDA) construction safety manager. The Contracting Officer will act on the HASP only after 30 day NEHC and EFD/EFA safety manager reviews.]

1.4.2 SD-18, Record

a. Daily Confined Space Entry Permit. Submit one copy of each permit attached to each Daily Production Report.

b. Reports. Submit reports as their incidence occurs, in accordance with the requirements of the paragraph entitled, "Reports."

1.5 QUALITY ASSURANCE

1.5.1 Qualifications

a. Qualifications of Safety Officer:

(1) Ability to manage the on-site contractor safety program through appropriate management controls,

(2) Ability to identify hazards and have the capability to expend resources necessary to abate the hazards.

(3) Must have worked on similar types of projects that are equal to or exceed the scope of the project assigned with the same responsibilities.

b. Qualifications of Qualified Person, Confined Space Entry. The qualified person shall be capable (by education and specialized training) of anticipating, recognizing, and evaluating employee exposure to hazardous substances or other unsafe conditions in a confined space. This person shall be capable of specifying necessary control and protective action to ensure worker safety. [Since this work involves marine operations that handle combustible or hazardous materials, this qualified person shall be a NFPA certified marine chemist.]

c. Qualification of Crane Operators. Crane operators shall meet the requirements in COE EM-385-1-1, Appendix G.

1.5.2 Qualifications of Qualified Person, Confined Space Entry

The qualified person shall be capable (by education and specialized training) of anticipating, recognizing, and evaluating employee exposure to hazardous substances or other unsafe conditions in a confined space. This person shall be capable of specifying necessary control and protective action to ensure worker safety. [Since this work involves marine operations that handle combustible or hazardous materials, this qualified person shall be a NFPA certified marine chemist.]

1.5.3 Qualification of Crane Operators

Crane operators shall meet the requirements in COE EM-385-1-1, Appendix G.

1.5.4 Meetings

1.5.4.1 Preconstruction Conference

The safety officer shall attend the preconstruction conference required by Section 01310, "Administrative Requirements."

****

NOTE: Include this requirement only for projects which require a Health and Safety Plan.

****

1.5.4.2 [Meeting on Work Procedures

Meet with Contracting Officer to discuss work procedures and safety precautions required by the HASP. Ensure the participation of the

Contractor's superintendent, the Quality Control, and the CSP or CIH.]

1.5.4.3 Weekly Safety Meetings

Hold weekly. Attach minutes showing contract title, signatures of attendees and a list of topics discussed to the QC Contractor Quality Control daily report.

1.6 ACCIDENT PREVENTION PLAN (APP)

Prepare the APP in accordance with the required and advisory provisions of COE EM-385-1-1 including Appendix A, "Minimum Basic Outline for Preparation of Accident Prevention Plan," and as modified herein. Include the associated AHA and other specific plans, programs and procedures listed on Pages A-3 and A-4 of COE EM-385-1-1, some of which are called out below.

1.6.1 Contents of the Accident Prevention Plan

a. Name and safety related qualifications of safety officer (including training and any certifications).

b. Qualifications of competent and of qualified persons.

c. Identify of the individual who will complete exposure data (hours worked); accident investigations, reports and logs; and immediate notification of accidents to include subcontractors.

d. Emergency response plan. Conform to COE EM-385-1-1, paragraph 01.E and include a map denoting the route to the nearest emergency care facility with emergency phone numbers. Contractor may be required to demonstrate emergency response.

e. Confined Space Entry Plan. Identify the qualified person's name and qualifications, training, and experience. Delineate the qualified person's authority to direct work stoppage in the event of hazardous conditions. Include procedure for rescue by contractor personnel and the coordination with emergency responders. (If there is no confined space work, include a statement that no confined space work exists and none will be created.)

[f. Hazardous Material Use. Provisions to deal with hazardous materials, pursuant to the Contract Clause "FAR 52.223-3, Hazardous Material Identification and Material Safety Data." And the following:

(1) Inventory of hazardous materials to be introduced to the site with estimated quantities.

(2) Plan for protecting personnel and property during the transport, storage and use of the materials

(3) Emergency procedures for spill response and disposal, including a site map with approximate quantities on site at any given time. The site map will be attached to the inventory, showing where the hazardous substances are stored

(4) Material Safety Data Sheets for inventoried materials not required in other section of this specification.

(5) Labeling system to identify contents on all containers on-site.

(6) Plan for communicating high health hazards to employees and adjacent occupants.]

g. Hazardous Energy Control Plan. For hazardous energy sources, comply with COE EM-385-1-i, paragraph 12.A.07.

[h. Critical Lift Procedures. Weight handling critical lift plans will be prepared and signed in accordance with COE EM-385-i-1, paragraph 16.c.18.]

i. Alcohol and Drug Abuse Plan

(1) Describe plan for random checks and testing with pre-employment screening in accordance with the DFAR Clause subpart 252.223-7004, "Drug Free Work Force."

(2) Description of the on-site prevention program

j. Fall Protection Plan. The plan shall be site specific and protect all workers at elevations above 1800 mm 6 feet.

k. Silica Exposure Reduction. The plan shall include specific procedures to prevent employee silica inhalation exposures.

[l. Lead Abatement Plan. The safety and health aspects of lead-based paint removal, prepared in accordance with Section 13283, "Removal and Disposal of Lead Containing Paint"].

[m. Asbestos Abatement Plan. The safety and health aspects prepared in accordance with Section 13281, "Engineering Control of Asbestos Containing Materials"]

[n. Site Demolition Plan. The safety and health aspects prepared in accordance with Section 02220, "Site Demolition"]

[o. Excavation Plan. The safety and health aspects prepared in accordance with Section 02302, "Excavation, Backfilling. and Compacting for Utilities"]

1.7 ACTIVITY HAZARD ANALYSIS (AHA)

Prepare for each phase of the work. As a minimum, define activity being performed, sequence of work, specific hazards anticipated, control measures to eliminate or reduce each hazard to acceptable levels, training requirements for all involved, and the competent person in charge of that phase of work. For work with fall hazards, including fall hazards associated with scaffold erection and removal, identify the appropriate fall arrest systems. For work with materials handling equipment, address safeguarding measures related to materials handling equipment. For work requiring excavations, include excavation safeguarding requirements. The appropriate AHA shall be reviewed and attendance documented by Contractor at the preparatory, initial, and follow-up phases of Quality Control inspection.

1.8 [HEALTH AND SAFETY PLAN (HASP)

****

NOTE: Include the following for projects where work involves hazardous waste work as directed by EFD/EFA environmental personnel or Safety Manager. An APP is separately required to define the "construction hazards" of HAZWASTE projects.

****

Prepare as required by 29 CFR 1910.120 and COE EM-385-1-1.

1.8.1 Qualified Personnel

Retain a Certified Industrial Hygienist (CIH) or a Certified Safety Professional (CSP) to prepare the HASP, conduct activity hazard analyses, and prepare detailed plan for demolition, removal, and disposal of materials. [Retain the CIH or CSP for duration of contract.]

1.8.2 Contents

In addition to the requirements of COE EM-385-1-1, Table 28-1, the HASP must include:

a. Location, size, and details of control areas.

b. Location and details of decontamination systems.

c. Interface of trades involved in the construction.

d. Sequencing of work.

e. Disposal plan.

f. Sampling protocols.

g. Testing labs.

h. Protective equipment.

i. Pollution control.

j. Evidence of compliance with 29 CFR 1910.120 and 29 CFR 1926.65.

k. Training and certifications of CIH, CSP or other competent persons.]

1.9 DRUG PREVENTION PROGRAM

Conduct a proactive drug and alcohol use prevention program for all workers, prime and subcontractor, on the site. Ensure that no employees either use illegal drugs or consume alcohol during work hours. Ensure no employees under the influence of drugs or alcohol during work hours. After accidents, collect blood, urine or saliva specimens and test injured employee influence. A copy of the test shall be made available to the Contracting Officer upon request.

1.10 FALL HAZARD PREVENTION PROGRAM

****

NOTE: Use this requirement if there will be any exposure to fall hazards.

****

1.10.1 Scaffolds

Delineate the fall protection requirements necessary during the erection and dismantling operation of scaffolds used on the project in the fall protection plan and activity hazard analysis for the phase of work.

1.10.2 Training

Institute a fall protection program. As part of the Fall Protection Program, contractor shall provide training for each employee who might be exposed to fall hazards.

1.11 DUTIES OF THE SAFETY OFFICER

a. Ensure construction hazards are identified and corrected.

b. Maintain applicable safety reference material on the job site.

c. Maintain a log of safety inspections performed.

****

NOTE: Include the requirement below only when a preconstruction conference is specified for the project.

****

d. Attend the pre-construction conference required by Section 01310, "Administrative Requirements."

1.12 DISPLAY OF SAFETY INFORMATION

Display the following information in clear view of the on-site construction personnel:

a. Map denoting the route to the nearest emergency care facility with emergency phone numbers.

b. AHA

c. Confined space entry permit.

[d. Sign with number of hours worked since last lost workday accident.]

1.13 SITE SAFETY REFERENCE MATERIALS

Maintain safety-related references applicable to the project, including those listed in the article "References." Maintain applicable equipment manufacturers' manuals.

1.14 [HIGH HAZARD WORK AND LONG DURATION

Work under this contract is potentially hazardous. Pursuant to contract clause "FAR 52.236-13, Accident Prevention, Alternate I," submit in writing additional proposals for effecting accident prevention under hazardous conditions. Meet in conference with Contracting Officer to discuss and develop mutual understanding relative to the administration of the overall safety program.]

1.15 EMERGENCY MEDICAL TREATMENT

Contractors will arrange for their own emergency medical treatment. Government has no responsibility to provide. However, if emergency medical care is rendered by Navy medical services, charges may be billed to Contractor at prevailing rates established in BUMED Instruction 6320.4 series. Reimbursement shall be made by Contractor to Naval Regional Medical Center Collection Agent upon receipt of monthly statement.

1.16 SITE CONDITIONS

****

NOTE: Noise exposure from adjacent Government activities must be evaluated based on the exposure potential of the construction site to the Government activities. These activities may require the Contractor to provide a hearing protection program for his employees far in excess of what his work would require. If so, include the criteria so that it is part of the contract that the Contractor bids on. Add the following sentences if warranted.

****

1.16.1 Noise

The adjacent Government activities produce sound-pressure levels of [_____] dBA steady state, or [_____] dBA for [_____] minutes, or [_____]. Enforce hearing protection protecting Contractor's site personnel from Government produced noise.

1.17 REPORTS

1.17.1 Reporting Reports

For OSHA recordable accidents, the prime contractor will conduct a suitable investigation, complete the Navy Contractor Significant Incident Report (CSIR) form and provide to the Contracting Officer within 5 calendar days of the accident.

1.17.2 Notification

Notify Contracting Officer, within 4 hours, of any accident meeting the definition of OSHA recordable occupational injury or illness. Information shall include Contractor name; contract title; type of contract; name of activity, installation or location where mishap occurred; date and time of mishap; names of personnel injured; extent of property damage, if any; and brief description of mishap (to include type of construction equipment used, PPE used, etc.) In addition to OSHA reporting requirements, initial notification shall be made of any accident involving significant mishaps.

1.17.3 Monthly Exposure Report

Monthly exposure reporting, to the Contracting Officer is required to be attached to the monthly billing request. This report is a compilation of employee-hours worked each month for all site workers, both prime and subcontractor.

1.17.4 OSHA Citations and Violations

Provide the Contracting Officer with a copy of each OSHA citation, OSHA

report and Contractor response. Correct violations and citations promptly and provide written corrective actions to the Contracting Officer.

PART 2 PRODUCTS

2.1 FALL PROTECTION ANCHORAGE

Fall protection anchorages, used by contractors to protect their people, will be left in place and so identified for continued customer use.

2.2 CONFINED SPACE SIGNAGE

Provide permanent signs integral to or securely attached to access covers for new confined spaces. Signs wording: "DANGER--PERMIT REQUIRED CONFINED SPACE - DO NOT ENTER -" on bold letters a minimum of 25 mm one inch in height and constructed to be clearly legible with all paint removed. The signal word "DANGER" and shall be red and readable from 1.52 m 5 feet.

PART 3 EXECUTION

3.1 CONSTRUCTION

Comply with COE EM-385-1-1, NFPA 241, the accident prevention plan, the activity hazard analysis and other related submittals and activity fire and safety regulations.

3.1.1 Hazardous Material Exclusions

Notwithstanding any other hazardous material used in this contract, radioactive materials or instruments capable of producing ionizing/non-ionizing radiation as well as materials which contain asbestos, mercury or polychlorinated biphenyls, di-isocynates, lead-based paint are prohibited. Exceptions to the use of any of the above excluded materials may be considered by Contracting Officer upon written request by Contractor.

3.1.2 Unforeseen Hazardous Material

The design should have identified materials such as PCB, lead paint, and friable and nonfriable asbestos. If [additional] material, not indicated, that may be hazardous to human health upon disturbance during construction operations is encountered, stop that portion of work and notify the Contracting Officer immediately. Within [14] [_____] calendar days the Government will determine if the material is hazardous. If material is not hazardous or poses no danger, the Government will direct the Contractor to proceed without change. If material is hazardous and handling of the material is necessary to accomplish the work, the Government will issue a modification pursuant to "FAR 52.243-4, Changes" and "FAR 52.236-2, Differing Site Conditions."

3.2 PRE-OUTAGE COORDINATION MEETING

Contractors are required to apply for utility outages a minimum of 15 days in advance. As a minimum, the request should include the location of the outage, utilities being effected, duration of outage and any necessary sketches. Once approved and prior to beginning work on the utility system requiring shut down, the Contractor shall attend a pre-outage coordination meeting with the ROICC and the Station Utilities Department to review the scope of work and the lock out/tag out procedures for worker protection.

3.3 PERSONNEL PROTECTION

3.3.1 Hazardous Noise

Provide hazardous noise signs, and hearing protection, where ever equipment and work procedures produce sound-presssure levels greater than 85 dBA steady state or 140 dBA impulse, regardless of the duration of the exposure.

3.3.2 Fall Protection

Enforce use of the fall protection device named for each activity in the AHA all times when an employee is on a surface 1800 mm 6 feet or more above lower levels. Personal fall arrest systems are required when working from an articulating or extendible boom, scissor lifts, swing stages, or suspended platform. Fall protection must comply with ANSI A10.14.

3.3.2.1 Personal Fall Arrest Device

Equipment, subsystems, and components shall meet ANSI Z359.1, Personal Fall Arrest Systems. Only an full-body harness with a shock absorbing lanyard is an acceptable personal fall arrest device. Body belts may only be used as positioning devices only such as for steel reinforcing assembly. Body belts are not authorized as a personal fall arrest device. Harnesses must have upper middle back "D" rings for proper body suspension during a fall. Lanyard must be fitted with a double locking snap hook attachment. Webbing, straps, and ropes must be of synthetic fiber or wire rope.

3.3.2.2 Fall Protection for Roofs

a. For work within 1800 mm 6 feet of an edge, on low pitched roofs, personnel shall be protected by use of personal fall arrest systems, guardrails, safety nets. Safety monitoring system is not adequate fall protection and is not authorized.

b. For work greater than 1800 mm 6 feet from an edge, warning lines shall be erected and installed in accordance with 29 CFR 1926.502(f).

c. Work on steep roofs requires personal fall arrest, guardrails with toeboards, or safety nets. This requirement includes residential or housing type construction.

3.3.2.3 Safety Nets

Safety nets shall be provided in unguarded workplaces over water, machinery, dangerous operations, or more than 7.5 meters 25 feet above surface.

3.3.3 Scaffolding

Employees shall be provided with a safe means of access to the work area on the scaffold. Climbing of any scaffold braces or supports not specifically designed for access is prohibited. Contractor shall ensure that scaffold erection is performed by employees that are qualified. Do not use scaffold without the capability of supporting at least four times the maximum intended load or without appropriate fall protection as delineated in the accepted fall protection plan. Minimum platform size shall be based on the platform not being greater in height than four times the dimension of the smallest width dimension for rolling scaffold. Some Baker type scaffolding has been found not to meet these requirements. Stationary scaffolds must

be attached to structural building components to safeguard against tipping forward or backward. The first tie-in shall be at the height equal to 4 times the width of the scaffold base.

3.3.4 Use of Material Handling Equipment

a. Material handling equipment such as forklifts shall not be modified with work platform attachments for supporting employees unless specifically delineated in the manufactures printed operating instructions. Crane supported work platforms shall only be used in extreme conditions if the Contractor proves that using any other access to the work location would provide a greater hazard to the workers.

b. Cranes must be equipped with Load Indicating Devices , anti-two blocks devices, load, boom angle moment indicating indicators.

c. Christmas-tree lifting (multiple rigged materials) is not allowed.

3.3.5 Excavations

The competent person for excavation shall be on site when work is being performed in excavation, and shall inspect excavations prior to entry by workers. Individual must evaluate for all hazards, including atmospheric, that may be associated with the work, and shall have the resources necessary to correct hazards promptly.

3.3.6 Conduct of Electrical Work

Underground electrical spaces must be certified safe for entry before entering to conduct work. Cable intended to be cut must be positively identified and de-energized prior to performing each cut. Perform all high voltage cutting remotely. When racking in or live switching of circuit breakers, no additional person other than the switch operator will be allowed in the space during the actual operation. Plan so that work near energized parts is minimized to the fullest extent possible. Use of electrical outages clear of any energized electrical sources is the preferred method. When working in energized substations, only qualified electrical workers shall be permitted to enter. When work requires Contractor to work near energized circuits as defined by the NFPA 70, high voltage personnel must use personnel protective equipment that includes, as a minimum, electrical hard hat, safety shoes, insulating gloves with leather protective sleeves, fire retarding shirts, coveralls, face shields, and safety glasses. Insulating blankets, hearing protection, and switching suits may be required, depending on the specific job and as delineated in the Contractor AHA.

3.3.7 Work in Manholes

Contractor shall provide mechanical ventilation for all work accomplished in manholes, unless other hazards are present like friable asbestos.

3.3.8 Work in Confined Spaces

Comply with the requirements in Section 06.I of COE EM-385-1-1. Any potential for a hazard in the confined space requires a permit system to be used.

a. Entry Procedures. Prohibit entry into a confined space by personnel for any purpose, including hot work, until the qualified

person has conducted appropriate tests to ensure the confined or enclosed space is safe for the work intended and that all potential hazards are controlled or eliminated and documented. (See Section 06.I.05 of COE EM-385-1-1 for entry procedures.) All hazards pertaining to the space shall be reviewed with each employee during review of the AHA.

b. Forced air ventilation is required for all confined space entry operations and the minimum air exchange requirements must be maintained.

c. Ensure the use of rescue and retrieval devices in confined spaces greater than 1500 mm 5 feet in depth. Conform to Sections 06.I.09, 06.I.10 and 06.I.11 of COE EM-385-1-1.

d. Sewer west walls require continuous atmosphere monitoring with audible alarm for toxic gas detection.

e. Include training information for employees who will be involved as entrant attendants for the work. Conform to Section 06.I.06 of COE EM-385-1-1.

f. Entry Permit. Use ENGFORM 5044-R or other form with the same minimum information for the Daily Confined Space Entry Permit, completed by the qualified person. Post the permit in a conspicuous place close to the confined space entrance.

3.3.9 Crystalline Silica

Grinding, abrasive blasting, and foundry operations of construction materials containing crystalline silica, shall comply with OSHA regulations, such as 29 CFR 1910.94, and COE EM-385-1-1, (Appendix C). The Contractor shall develop and implement effective exposure control and elimination procedures to include dust control systems, engineering controls, and establishment of work area boundaries, as well as medical surveillance, training, air monitoring, and personal protective equipment.

3.4 ACCIDENT SCENE PRESERVATION

For serious accidents, ensure the accident site is secured and evidence is protected remaining undisturbed until released by the Contracting Officer.

3.5 FIELD QUALITY CONTROL

3.5.1 Inspections

Include safety inspection as a part of the daily Quality Control inspections required in Section 01450, "Quality Control."

****

NOTE: Suggestions for improvement of this specification will be welcomed using the Navy "Change Request Forms" subdirectory located in SPECSINTACT in Jobs or Masters under "Forms/Documents" directory or DD Form 1426. Suggestions should be forwarded to:

Commanding Officer
Naval Construction Battalion Center
NAVFAC 15G/CESO 15E

1000 23rd Avenue
Port Hueneme, CA 93043-4301

FAX: (805) 985-6465/982-5196 or DSN 551-5196

****

-- End of Section --

Appendix C: Sample Contractor Safety Evaluation Questionnaire

Items for Inclusion in Contractor Safety Evaluation Questionnaire

1. List your firm's Interstate Experience Modification Rate for the last 3 years:
   198 _____ 198 _____ 198 _____

2. Please use your last year's OSHA no. 200 log to fill in:
   Number of injuries and illnesses:
   (*a*) number of lost workday cases _____
   (*b*) number of restricted workday cases _____
   (*c*) number of cases with medical attention only _____
   (*d*) number of fatalities _____

3. Employee hours worked last year (do not include any nonwork time, even though paid) _____

4. Check your type of work:
   Nonresidential building _____
   Heavy (nonhighway) construction _____
   Plumbing, heating, and air conditioning _____
   Other _____

5. Are accident reports (OSHA 200) and report summaries sent to the following? How often?

	No	Yes	Monthly	Quarterly	Annually
Field superintendent	_____	_____	_____	_____	_____
Vice president of construction	_____	_____	_____	_____	_____
President of firm	_____	_____	_____	_____	_____

6. Do you hold site safety meetings for field supervisors?
   Yes _____ No _____ How often? Weekly _____ Biweekly _____
   Monthly _____ Less often, as needed _____

(Continued)

7. Do you conduct project safety inspections? Yes _____ No _____
If yes, who conducts this inspection (title)? _____
_____ And how often?_____

8. How are accident records and accident summaries kept? How often are they reported?

	No	Yes	Monthly	Annually
Accidents totaled for all company	_____	_____	_____	_____
Accidents totaled by project	_____	_____	_____	_____
Subtotaled by superintendent	_____	_____	_____	_____
Subtotaled by foreman	_____	_____	_____	_____

9. How are the costs of individual accidents kept? How often are they reported?

	No	Yes	Monthly	Annually
Costs totaled for all company	_____	_____	_____	_____
Costs totaled by project	_____	_____	_____	_____
Subtotaled by superintendent	_____	_____	_____	_____
Subtotaled by foreman	_____	_____	_____	_____

10. List key personnel planned for this project. Please list names, expected positions, and safety performance on last three projects worked on.

11. Do you have a written safety program? Yes _____ No _____

12. Do you have an orientation program for new hires? Yes _____ No _____
If yes, does this include instruction on the following?

	Yes	No
a. Head protection	_____	_____
b. Eye protection	_____	_____
c. Hearing protection	_____	_____
d. Respiratory protection	_____	_____
e. Safety belts and lifeline	_____	_____
f. Scaffolding	_____	_____
g. Perimeter guarding	_____	_____
h. Housekeeping	_____	_____
i. Fire protection	_____	_____
j. First aid facilities	_____	_____
k. Emergency procedures	_____	_____
l. Toxic substances	_____	_____
m. Trenching and excavation	_____	_____
n. Signs, barricades, flagging	_____	_____
o. Electrical safety	_____	_____
p. Rigging and crane safety	_____	_____

13. Do you have a training program for newly hired or promoted foremen?
No _____ Yes _____
If yes, does it include instruction on the following?

	Yes	No
a. Safe work practices	_____	_____
b. Safety supervision	_____	_____
c. Toolbox meetings	_____	_____
d. Emergency procedures	_____	_____
e. First aid procedures	_____	_____
f. Accident investigation	_____	_____

(Continued)

g. Fire protection and prevention	_____	_____
h. New-worker orientation	_____	_____

14. Do you hold craft toolbox safety meetings? Yes _____ No _____
How often? Weekly _____ Biweekly _____ Monthly _____
Less often, as needed _____

SOURCE: Adapted from Levitt et al., 1981.

Appendix D: Sample CII Safety Data Request

1996 CII Safety Data Request

[redacted]

Please return the completed form to Barbara Smith by June 15, 1997.

Instructions

Please record 1996 accident data for your company's employees in Table 1 and for your subcontractors' employees in Table 2. Data should be in accordance with OSHA definitions (e.g., a lost workday case is an injury that results in days away from work or restricted activity of both). A consolidated OSHA 200 log is the ideal source for this data.

If you did not collect data in 1996, please write "did not collect" across the row and return the form to the individual named at the top of this page.

Table 1. Accident data for your Direct-hire Employees

Year	Total Number of Recordable Cases	Total Number of Lost Workday Cases	Total Number of Lost Workdays	Total Number of Fatalities	Total Workhours
1996	277	27	284	Ø	18,460,121

Table 2. Accident data for your Subcontractors' Employees

Year	Total Number of Recordable Cases	Total Number of Lost Workday Cases	Total Number of Lost Workdays	Total Number of Fatalities	Total Workhours
1996	DID NOT COLLECT				

Name and phone number of person completing this form (in the event clarification is required):

Richard S. Baldwin, CSP [redacted] 972-6833

Name Phone

Owners Responding to the 1989CII Safety Survey

Company Name	Company	Class	Year	Fatalitites.	LW Cases	RI Cases	Work hours	LWCIR	RIR
Con Edison	2	O	1989	0	25	59	1,409,368	3.55	8.37
DuPont	3	O	1989	0	12	305	24,318,512	0.10	2.51
Eli Lilly	4	O	1989	1	128	225	1,878,000	13.63	23.96
Exxon	5	O	1989	0	19	44	2,308,000	1.65	3.81
Glaxo Inc.	6	O	1989	0	4	62	2,649,000	0.30	4.68
Monsanto	7	O	1989	0	1	10	716,029	0.28	2.79
North'n States Pwr	8	O	1989	0	45	117	1,798,292	5.00	13.01
Phillips	9	O	1989	0	5	50	1,831,866	0.55	5.46
Phillips	10	O	1989	4	11	99	2,390,720	0.92	8.28
Shell	11	O	1989	1	36	174	7,867,466	0.92	4.42
Shell	12	O	1989	0	52	121	4,053,357	2.57	5.97
Texas Eastman	13	O	1989	0	3	92	1,753,096	0.34	10.50
TVA	14	O	1989	0	10	79	1,484,600	1.35	10.64
	Totals for 1989			6	351	1,437	54,458,306	1.29	5.28
			FIR=	22.04					
	Max			4	128	305	24,318,512	13.63	23.96
	Min			0	1	10	716,029	0.10	2.51
	Average			0.5	27	111	4,189,100	2.40	8.03
	Median			0.0	12	92	1,878,000	0.92	5.97
	Std. Dev.			1.1	35	82	6,308,314	3.68	5.79

Owners Responding to the 1990 CII Safety Survey

Company Name	Company	Class	Year	Fatalitites.	LW Cases	RI Cases	Work hours	LWCIR	RIR
Con Edison	1	O	1990	0	17	28	1,114,931	3.05	5.02
DuPont	2	O	1990	1	4	311	25,093,482	0.03	2.48
Eli Lilly	3	O	1990	0	147	525	4,570,000	6.43	22.98
Exxon	4	O	1990	0	20	106	2,024,000	1.98	10.47
Glaxo Inc.	5	O	1990	0	2	56	2,864,000	0.14	3.91
Monsanto	6	O	1990	0	16	62	3,098,987	1.03	4.00
North'n States Pwr	7	O	1990	0	31	81	1,561,672	3.97	10.37
Phillips	8	O	1990	2	5	149	8,094,373	0.12	3.68
Phillips	9	O	1990	0	15	95	2,771,157	1.08	6.86
Procter & Gamble	10	O	1990	0	37	178	6,852,769	1.08	5.19
Shell	11	O	1990	2	62	183	8,480,825	1.46	4.32
Shell	12	O	1990	0	52	152	4,837,596	2.15	6.28
Texas Eastman	13	O	1990	0	7	123	2,680,328	0.52	9.18
TVA	14	O	1990	0	8	81	1,493,000	1.07	10.85
	Totals for 1990			5	423	2,130	75,537,120	1.12	5.64
			FIR=	13.24					
	Max			2	147	525	25,093,482	6.43	22.98
	Min			0	2	28	1,114,931	0.03	2.48
	Average			0.4	30	152	5,395,509	1.72	7.54
	Median			0.0	17	115	2,981,494	1.08	5.74
	Std. Dev.			0.7	38	129	6,161,230	1.76	5.26

Owners Responding to the 1991CII Safety Survey

Company Name	Company	Class	Year	Fatalitites.	LW Cases	RI Cases	Work hours	LWCIR	RIR
ALCOA	1	O	1991	0	16	53	1,784,500	1.79	5.94
Annheuser-Busch	2	O	1991	1	78	170	3,470,000	4.50	9.80
BP Oil	3	O	1991	1	0	1	37,401	0.00	5.35
BP Oil	4	O	1991	2	42	107	2,708,599	3.10	7.90
Con Edison	5	O	1991	0	13	24	1,475,903	1.76	3.25
DuPont	6	O	1991	0	8	216	21,135,133	0.08	2.04
Eli Lilly	7	O	1991	0	231	953	7,065,000	6.54	26.98
Exxon	8	O	1991	0	42	171	4,583,000	1.83	7.46
Glaxo Inc.	9	O	1991	0	10	9	3,069,000	0.65	0.59
HL&P	10	O	1991	1	6	24	254,264	4.72	18.88
Hoffman-LaRoche	11	O	1991	0	2	5	168,705	2.37	5.93
Monsanto	12	O	1991	1	8	40	3,039,343	0.53	2.63
North'n States Pwr	13	O	1991	0	28	85	2,006,971	2.79	8.47
Phillips	14	O	1991	0	4	135	8,298,176	0.10	3.25
Phillips	15	O	1991	0	12	102	4,073,853	0.59	5.01
Procter & Gamble	16	O	1991	0	13	130	7,608,683	0.34	3.42
Rohm & Haas	17	O	1991	0	12	41	1,051,000	2.28	7.80
Shell	18	O	1991	1	58	183	11,884,567	0.98	3.08
Shell	19	O	1991	2	31	106	4,750,359	1.31	4.46
Texaco	20	O	1991	1	372	717	10,451,451	7.12	13.72
Tennessee Eastmn	21	O	1991	0	12	116	6,029,025	0.40	3.85
Texas Eastman	22	O	1991	0	13	98	3,507,978	0.74	5.59
TVA	23	O	1991	0	8	79	1,818,500	0.88	8.69
	Totals for 1991			10	1019	3565	110,271,411	1.85	6.47
			FIR=	18.14					
	Max			2	372	953	21,135,133	7.12	26.98
	Min			0	0	1	37,401	0.00	0.59
	Average			0.4	44	155	4,794,409	1.97	7.13
	Median			0.0	13	102	3,470,000	1.31	5.59
	Std. Dev.			0.7	86	226	4,795,362	2.02	5.91

Owners Responding to the 1992 CII Safety Survey

Company Name	Company	Class	Year	Fatalitites.	LW Cases	RI Cases	Work hours	LWCIR	RIR
ALCOA	1	O	1992	0	11	64	2,825,600	0.78	4.53
Annheuser-Busch	2	O	1992	0	16	79	2,726,000	1.17	5.80
BP Oil	3	O	1992	1	7	44	1,262,199	1.11	6.97
BP Oil	4	O	1992	0	26	90	3,290,937	1.58	5.47
Con Edison	5	O	1992	0	13	25	1,507,912	1.72	3.32
DuPont	6	O	1992	0	7	225	26,346,773	0.05	1.71
DuPont	7	O	1992	0	0	0	282,101	0.00	0.00
Eli Lilly	8	O	1992	0	65	337	4,658,000	2.79	14.47
Exxon	9	O	1992	0	24	135	8,227,000	0.58	3.28
Glaxo Inc.	10	O	1992	0	0	1	803,000	0.00	0.25
Glaxo Inc.	11	O	1992	0	1	1	891,000	0.22	0.22
HL&P	12	O	1992	0	3	21	480,041	1.25	8.75
Hoechst Celanese	13	O	1992	1	19	105	3,874,649	0.98	5.42
Hoffman-LaRoche	14	O	1992	0	8	18	479,936	3.33	7.50
Monsanto	15	O	1992	0	25	100	5,643,277	0.89	3.54
North'n States Pwr	16	O	1992	0	29	96	2,177,938	2.66	8.82
Phillips	17	O	1992	0	15	134	4,785,784	0.63	5.60
Phillips	18	O	1992	0	21	89	3,769,674	1.11	4.72
Procter & Gamble	19	O	1992	0	12	92	6,292,648	0.38	2.92
Rohm & Haas	20	O	1992	0	1	6	639,000	0.31	1.88
Shell	21	O	1992	1	12	85	9,826,595	0.24	1.73
Shell	22	O	1992	0	15	60	3,507,458	0.86	3.42
Texaco	23	O	1992	0	186	468	14,734,769	2.52	6.35
Tennessee Eastmn	24	O	1992	0	9	88	5,517,955	0.33	3.19
Texas Eastman	25	O	1992	0	8	98	4,026,729	0.40	4.87
TVA	26	O	1992	0	13	144	3,669,700	0.71	7.85
	Totals for 1992			3	546	2,605	122,246,675	0.89	4.26
			FIR=	4.91					
	Max			1	186	468	26,346,773	3.33	14.47
	Min			0	0	0	282,101	0.00	0.00
	Average			0.1	21	100	4,701,795	1.02	4.71
	Median			0.0	13	89	3,588,579	0.82	4.63
	Std. Dev.			0.3	36	105	5,497,909	0.91	3.21

Owners Responding to the 1993 CII Safety Survey

Company Name	Company	Class	Year	Fatalitites.	LW Cases	RI Cases	Work hours	LWCIR	RIR
ALCOA	1	O	1993	0	14	46	2,521,000	1.11	3.65
Annheuser-Busch	2	O	1993	0	16	62	3,035,800	1.05	4.08
BP Oil	3	O	1993	0	0	40	1,959,843	0.00	4.08
Con Edison	4	O	1993	0	11	16	1,628,087	1.35	1.97
DuPont	5	O	1993	0	6	189	26,529,863	0.05	1.42
Elf Atochem	6	O	1993	0	2	5	253,724	1.58	3.94
Eli Lilly	7	O	1993	0	26	212	3,287,000	1.58	12.90
Exxon	8	O	1993	0	12	99	4,839,000	0.50	4.09
Glaxo Inc.	9	O	1993	0	1	6	524,700	0.38	2.29
HL&P	10	O	1993	0	4	36	965,147	0.83	7.46
Hoechst Celanese	11	O	1993	0	26	122	9,149,418	0.57	2.67
Hoffman-LaRoche	12	O	1993	0	1	10	828,420	0.24	2.41
Merck	13	O	1993	0	25	82	5,278,212	0.95	3.11
Monsanto	14	O	1993	0	29	97	6,428,225	0.90	3.02
North'n States Pwr	15	O	1993	0	7	42	795,645	1.76	10.56
Phillips	16	O	1993	0	2	24	1,991,914	0.20	2.41
Procter & Gamble	17	O	1993	0	10	70	6,473,862	0.31	2.16
Rohm & Haas	18	O	1993	0	0	5	509,000	0.00	1.96
Shell	19	O	1993	0	2	39	5,150,722	0.08	1.51
Texaco	20	O	1993	0	220	471	14,082,657	3.12	6.69
Tennessee Eastmn	21	O	1993	1	10	89	5,973,271	0.33	2.98
Texas Eastman	22	O	1993	0	1	2	536,731	0.37	0.75
TVA	23	O	1993	0	14	188	4,745,600	0.59	7.92
	Totals for 1993			1	439	1952	107,487,841	0.82	3.63
			FIR=	1.86					
	Max			1	220	471	26,529,863	3.12	12.90
	Min			0	0	2	253,724	0.00	0.75
	Average			0.0	19	85	4,673,384	0.78	4.09
	Median			0.0	10	46	3,035,800	0.57	3.02
	Std. Dev.			0.2	45	104	5,810,440	0.74	3.05

Owners Responding to the 1994 CII Safety Survey

Company Name	Company	Class	Year	Fatalitites.	LW Cases	RI Cases	Work hours	LWCIR	RIR
Alcoa	1	O	1994	0	15	60	2,097,900	1.43	5.72
Annheuser-Busch	2	O	1994	0	5	44	2,800,000	0.36	3.14
Arco	3	O	1994	0	3	46	2,754,615	0.22	3.34
Consolidated Edison	6	O	1994	1	10	12	994,258	2.01	2.41
Dow	7	O	1994	0	6	61	3,451,219	0.35	3.53
Dupont	8	O	1994	0	7	134	20,860,329	0.07	1.28
Eastman	9	O	1994	0	0	29	3,739,560	0.00	1.55
Exxon	11	O	1994	0	9	108	23,536,000	0.08	0.92
FMC	12	O	1994	0	5	21	652,488	1.53	6.44
Hoechst Celanese	13	O	1994	0	13	107	8,985,476	0.29	2.38
Hoffman LaRoche	14	O	1994	0	3	7	454,850	1.32	3.08
HL&P	15	O	1994	0	7	15	866,605	1.62	3.46
Intel	16	O	1994	0	20	369	12,398,330	0.32	5.95
Eli Lilly	17	O	1994	0	15	104	2,490,828	1.20	8.35
Merck	18	O	1994	0	6	34	3,250,874	0.37	2.09
Monsanto	19	O	1994	0	57	131	8,896,157	1.28	2.95
Northern States	20	O	1994	0	9	26	1,017,200	1.77	5.11
Phillips	21	O	1994	0	12	56	4,674,606	0.51	2.40
Procter & Gamble	22	O	1994	0	17	113	8,446,064	0.40	2.68
James River	23	O	1994	0	4	13	276,067	2.90	9.42
Rohm & Haas	24	O	1994	1	33	121	5,063,511	1.30	4.78
Shell	25	O	1994	0	10	136	13,582,084	0.15	2.00
Sun	26	O	1994	0	28	62	1,244,135	4.50	9.97
Texaco	27	O	1994	2	175	358	11,018,331	3.18	6.50
TVA	28	O	1994	1	8	173	5,890,864	0.27	5.87
Union Carbide	29	O	1994	0	3	26	885,393	0.68	5.87
USX	30	O	1994	2	114	256	4,152,817	5.49	12.33
	Totals for 1994			7	594	2622	121,522,240	0.98	4.32
			FIR=	11.52					
	Max			2	175	369	23,536,000	5.49	12.33
	Min			0	0	7	276,067	0.00	0.92
	Average			0.3	26	108	5,721,502	1.24	4.58
	Median			0.0	10	104	3,451,219	0.68	3.46
	Std. Dev.			0.6	43	106	6,088,445	1.38	2.88

Owners Responding to the 1995 CII Safety Survey

Company Name	Company	Class	Year	Fatalitites.	LW Cases	RI Cases	Work hours	LWCIR	RIR
Alcoa	1	O	1995	0	15	63	2,781,500	1.08	4.53
Annheuser-Busch	3	O	1995	0	14	76	4,213,440	0.66	3.61
Champion	5	O	1995	0	3	40	1,481,565	0.40	5.40
Consolidated Edison	7	O	1995	0	8	11	634,957	2.52	3.46
Dow	8	O	1995	0	4	52	2,643,589	0.30	3.93
Dupont	9	O	1995	1	6	121	21,425,962	0.06	1.13
Eastman	10	O	1995	0	11	66	6,717,926	0.33	1.96
Eli Lilly	11	O	1995	0	10	157	3,336,000	0.60	9.41
Exxon	13	O	1995	0	6	29	8,101,000	0.15	0.72
FMC	14	O	1995	0	3	8	1,361,731	0.44	1.17
HL&P	16	O	1995	0	7	13	670,950	2.09	3.88
Hoechst Celanese	17	O	1995	0	24	160	12,770,792	0.38	2.51
Intel	19	O	1995	0	22	286	15,843,030	0.28	3.61
James River	20	O	1995	0	0	15	724,582	0.00	4.14
Merck	21	O	1995	0	5	19	3,505,665	0.29	1.08
Monsanto	23	O	1995	0	17	84	6,835,135	0.50	2.46
Phillips	26	O	1995	0	0	40	4,537,984	0.00	1.76
Procter & Gamble	27	O	1995	0	16	80	9,163,465	0.35	1.75
Rohm & Haas	28	O	1995	0	29	120	6,987,385	0.83	3.43
Sun	30	O	1995	0	1	8	294,541	0.68	5.43
TVA	32	O	1995	0	10	128	5,225,745	0.38	4.90
U. S. Generating	33	O	1995	0	22	95	3,244,420	1.36	5.86
Union Carbide	35	O	1995	0	19	110	3,290,140	1:15	6.69
	Totals for 1995			1	220	1602	125,791,504	0.35	2.55
			FIR=	1.59					
	Max			1	29	286	21,425,962	2.52	9.41
	Min			0	0	8	294,541	0.00	0.72
	Average			0.0	11	89	5,469,196	0.64	3.60
	Median			0.0	10	84	3,505,665	0.40	3.61
	Std. Dev.			0.2	8	77	5,248,901	0.63	2.10

Owners Responding to the 1996CII Safety Survey

Company Name	Company	Class	Year	Fatal.	LW Cases	RI Cases	Work Hours	LWCIR	RIR
ALCOA	1	O	1996	1	94	304	21,268,223	0.88395	2.86
Amoco	2	O	1996	1	17	81	18,724,556	0.18158	0.87
Anheuser-Busch	3	O	1996	0	9	71	4,900,000	0.36735	2.90
Army Corps of Enginee	4	O	1996	4	326		78,018,378	0.83570	0.00
Atlantic Richfield Co.	5	O	1996	0	0	10	893,374	0.00000	2.24
Champion International	6	O	1996	0	1	15	610,538	0.32758	4.91
Chevron U.S.A.	7	O	1996	0	5	55	8,658,465	0.11549	1.27
CITGO Petroleum Corp	8	O	1996	0	1	7	2,964,963	0.06745	0.47
E.I. DuPont de Nemour	9	O	1996	0	6	113	24,726,033	0.04853	0.91
Eastman Chemical	10	O	1996	0	2	80	8,042,690	0.04973	1.99
Eli Lilly	11	O	1996	1	5	76	2,448,000	0.40850	6.21
Exxon Research	12	O	1996	0	4	28	5,463,000	0.14644	1.03
Hoechst Celanese Corp	13	O	1996	0	7	34	2,636,065	0.53109	2.58
HL&P	14	O	1996	0	3	7	609,192	0.98491	2.30
Intel	15	O	1996	0	22	119	11,989,890	0.36698	1.99
James River	16	O	1996	0	1	21	1,215,876	0.16449	3.45
Merck & Co.	17	O	1996	0	2	35	4,026,766	0.09934	1.74
Mobil Technology Corp	18	O	1996	0	39	1584	52,200,000	0.14943	6.07
Monsanto Chemical	19	O	1996	0	30	109	8,927,000	0.67212	2.44
NAVFAC	20	O	1996	7	125		39,758,002	0.62880	0.00
Phillips Petroleum	21	O	1996	0	3	44	5,993,259	0.10011	1.47
Rohm & Haas	22	O	1996	0	15	60	5,831,206	0.51447	2.06
Sun	23	O	1996	0	5	11	442,161	2.26162	4.98
TVA	24	O	1996	0	2	58	2,921,413	0.13692	3.97
Union Carbide	25	O	1996	0	5	41	5,398,000	0.18525	1.52
Weyerhaeuser Paper Co	26	O	1996	0	11	150	7,074,847	0.31096	4.24
	Totals for 1996			14	753	3173	480,402,818	0.31	1.32
			FIR=	5.93					
	Max			7	326	1584	78,018,378	2	6
	Min			0	0	7	442,161	0	0
	Average			0.5	28.5	129.7	12,528,535	0.4	2.5
	Median			0.0	5.0	56.5	5,647,103	0.2	2.1
	Std. Dev.			1.6	67.4	316.3	18,266,285	0.5	1.7

Appendix F: Contractor Responses to the CII Safety Data Request

Contractors Responding to the 1989 CII Safety Survey

Company	Class	Year	Fatal.	LW Cases	RI Cases	Work hours	LWIR	RIR
1	C	1989	0	471	810	6,824,583	13.80	23.74
2	C	1989	0	141	236	3,994,099	7.06	11.82
3	C	1989	0	27	89	3,689,821	1.46	4.82
4	C	1989	0	9	32	1,160,430	1.55	5.52
5	C	1989	0	130	296	15,219,845	1.71	3.89
6	C	1989	2	133	463	11,169,071	2.38	8.29
7	C	1989	0	60	388	15,219,278	0.79	5.10
8	C	1989	0	180	393	16,396,961	2.20	4.79
9	C	1989	0	117	409	16,965,303	1.38	4.82
10	C	1989	0	40	90	1,286,708	6.22	13.99
11	C	1989	0	59	261	2,899,928	4.07	18.00
12	C	1989	0	20	108	4,810,765	1.21	4.49
13	C	1989	1	62	117	1,646,581	7.53	14.21
14	C	1989	1	86	1997	61,552,832	0.28	6.49
15	C	1989	0	0	8	570,400	0.00	2.81
16	C	1989	0	81	192	3,665,713	4.42	10.48
17	C	1989	0	76	31	2,956,337	5.14	2.10
18	C	1989	0	40	41	2,078,140	3.85	3.95
19	C	1989	0	17	31	323,546	10.51	19.16
20	C	1989	0	31	100	1,616,152	3.84	12.38
21	C	1989	0	2	106	1,688,597	0.24	12.55
22	C	1989	0	11	77	2,188,222	1.01	7.04
23	C	1989	4	94	425	8,500,000	2.21	10.00
24	C	1989	0	21	190	6,200,000	0.68	6.13
25	C	1989	0	14	37	843,142	3.32	8.78
26	C	1989	0	55	90	1,338,564	8.22	13.45
27	C	1989	0	56	474	21,514,446	0.52	4.41
28	C	1989	0	9	27	847,665	2.12	6.37
29	C	1989	0	15	64	1,143,839	2.62	11.19
30	C	1989	0	71	225	8,716,487	1.63	5.16
31	C	1989	0	3	21	672,000	0.89	6.25
32	C	1989	0	17	93	477,794	7.12	38.93
33	C	1989	0	3	123	2,623,420	0.23	9.38
34	C	1989	0	16	68	1,971,824	1.62	6.90
35	C	1989	0	3	13	461,760	1.30	5.63
36	C	1989	0	8	177	10,600,000	0.15	3.34
37	C	1989	0	7	60	4,089,580	0.34	2.93
38	C	1989	1	258	1005	9,490,600	5.44	21.18
39	C	1989	0	1	11	3,622,975	0.06	0.61
40	C	1989	0	45	147	1,640,203	5.49	17.92
41	C	1989	0	3	7	81,397	7.37	17.20
42	C	1989	0	3	7	266,479	2.25	5.25
43	C	1989	0	49	234	2,476,412	3.96	18.90
44	C	1989	0	11	34	335,400	6.56	20.27
45	C	1989	0	180	440	4,694,006	7.67	18.75
Totals for 1989			9	2,744	10,247	270,531,305	2.03	7.58
		FIR =	6.65					
Max			4	471	1,997	61,552,832	13.80	38.93
Min			0	0	7	81,397	0.00	0.61
Average			0.2	61	228	6,011,807	3.39	10.21
Median			0.0	31	106	2,623,420	2.21	7.04
Std. Dev.			0.7	85	343	9,984,894	3.15	7.44

Contractors Responding to the 1990 CII Safety Survey

Company	Class	Year	Fatal.	LW Cases	RI Cases	Work hours	LWIR	RIR
1	C	1990	2	431	526	6,347,204	13.58	16.57
2	C	1990	0	113	238	5,004,747	4.52	9.51
3	C	1990	0	23	63	2,258,432	2.04	5.58
4	C	1990	0	5	13	1,181,056	0.85	2.20
5	C	1990	0	95	331	8,608,802	2.21	7.69
6	C	1990	2	187	407	22,002,357	1.70	3.70
7	C	1990	2	54	371	10,746,646	1.00	6.90
8	C	1990	0	87	412	12,436,358	1.40	6.63
9	C	1990	2	125	376	26,298,063	0.95	2.86
10	C	1990	1	93	416	23,077,562	0.81	3.61
11	C	1990	0	1	36	328,000	0.61	21.95
12	C	1990	0	23	65	1,416,243	3.25	9.18
13	C	1990	0	47	198	2,718,396	3.46	14.57
14	C	1990	0	7	9	430,074	3.26	4.19
15	C	1990	1	287	406	7,344,375	7.82	11.06
16	C	1990	0	53	114	2,211,657	4.79	10.31
17	C	1990	1	84	1908	67,691,694	0.25	5.64
18	C	1990	0	1	7	567,634	0.35	2.47
19	C	1990	0	52	196	7,721,790	1.35	5.08
20	C	1990	0	32	88	4,451,235	1.44	3.95
21	C	1990	0	31	33	1,850,669	3.35	3.57
22	C	1990	0	4	10	123,450	6.48	16.20
23	C	1990	0	39	139	1,392,511	5.60	19.96
24	C	1990	0	4	44	971,126	0.82	9.06
25	C	1990	0	5	42	2,009,654	0.50	4.18
26	C	1990	2	96	334	10,500,000	1.83	6.36
27	C	1990	0	23	255	8,500,000	0.54	6.00
28	C	1990	0	9	26	548,040	3.28	9.49
29	C	1990	0	50	86	1,236,149	8.09	13.91
30	C	1990	0	56	503	24,009,103	0.47	4.19
31	C	1990	0	12	39	588,336	4.08	13.26
32	C	1990	0	18	79	2,814,412	1.28	5.61
33	C	1990	0	34	153	7,992,157	0.85	3.83
34	C	1990	0	0	17	270,000	0.00	12.59
35	C	1990	0	1	14	198,257	1.01	14.12
36	C	1990	0	6	6	761,904	1.58	1.58
37	C	1990	0	4	131	5,640,738	0.14	4.64
38	C	1990	0	3	44	1,675,339	0.36	5.25
39	C	1990	0	4	13	361,920	2.21	7.18
40	C	1990	0	15	236	11,400,000	0.26	4.14
41	C	1990	0	28	75	6,084,771	0.92	2.47
42	C	1990	2	123	722	11,246,946	2.19	12.84
43	C	1990	0	74	459	4,473,271	3.31	20.52
44	C	1990	0	5	33	2,739,067	0.37	2.41
45	C	1990	0	49	136	1,992,252	4.92	13.65
46	C	1990	0	0	0	34,957	0.00	0.00
47	C	1990	0	5	11	1,024,265	0.98	2.15
48	C	1990	0	32	101	2,779,135	2.30	7.27
49	C	1990	0	9	24	341,300	5.27	14.06
50	C	1990	0	56	105	2,500,000	4.48	8.40
51	C	1990	0	168	389	5,041,954	6.66	15.43
52	C	1990	0	6	49	3,067,000	0.39	3.20
Totals for 1990			15	2,769	10,488	337,011,008	1.64	6.22
		FIR=	8.90					
Max			2	431	1,908	67,691,694	13.58	21.95
Min			0	0	0	34,957	0.00	0.00
Average			0.3	53	202	6,480,981	2.50	8.10
Median			0.0	30	95	2,728,732	1.51	6.49
Std. Dev.			0.7	77	298	10,777,873	2.62	5.40

Contractors Responding to the 1991 CII Safety Survey

Company	Class	Year	Fatal.	LW Cases	RI Cases	Work hours	LWIR	RIR
1	C	1991	0	174	296	5,280,093	6.59	11.21
2	C	1991	0	2	10	4,036,499	0.10	0.50
3	C	1991	0	14	34	992,567	2.82	6.85
4	C	1991	0	12	40	1,273,707	1.88	6.28
5	C	1991	0	143	403	15,839,263	1.81	5.09
6	C	1991	1	159	335	18,525,609	1.72	3.62
7	C	1991	0	166	717	17,580,832	1.89	8.16
8	C	1991	0	56	303	10,200,696	1.10	5.94
9	C	1991	0	160	336	24,338,388	1.31	2.76
10	C	1991	1	160	461	24,038,865	1.33	3.84
11	C	1991	0	1	11	458,000	0.44	4.80
12	C	1991	0	5	31	905,731	1.10	6.85
13	C	1991	0	0	0	114,186	0.00	0.00
14	C	1991	0	17	181	2,490,806	1.37	14.53
15	C	1991	0	15	80	1,348,878	2.22	11.86
16	C	1991	0	246	273	19,336,205	2.54	2.82
17	C	1991	0	52	107	2,401,901	4.33	8.91
18	C	1991	1	74	1353	74,382,694	0.20	3.64
19	C	1991	0	2	8	699,850	0.57	2.29
20	C	1991	0	31	131	6,568,302	0.94	3.99
21	C	1991	0	27	61	3,382,820	1.60	3.61
22	C	1991	0	13	13	1,821,041	1.43	1.43
23	C	1991	1	221	660	13,214,120	3.34	9.99
24	C	1991	0	2	8	109,168	3.66	14.66
25	C	1991	0	29	120	1,471,206	3.94	16.31
26	C	1991	0	1	19	962,482	0.21	3.95
27	C	1991	0	10	38	1,910,903	1.05	3.98
28	C	1991	2	48	391	9,800,000	0.98	7.98
29	C	1991	0	7	198	9,400,000	0.15	4.21
30	C	1991	0	13	29	617,480	4.21	9.39
31	C	1991	2	56	107	2,020,353	5.54	10.59
32	C	1991	0	60	487	26,312,046	0.46	3.70
33	C	1991	0	3	16	686,816	0.87	4.66
34	C	1991	0	29	75	2,569,587	2.26	5.84
35	C	1991	0	22	124	7,731,888	0.57	3.21
36	C	1991	0	1	4	270,000	0.74	2.96
37	C	1991	0	36	122	2,337,663	3.08	10.44
38	C	1991	0	4	4	515,409	1.55	1.55
39	C	1991	0	6	124	5,373,488	0.22	4.62
40	C	1991	0	3	30	2,019,861	0.30	2.97
41	C	1991	0	4	7	388,960	2.06	3.60
42	C	1991	0	6	203	7,700,000	0.16	5.27
43	C	1991	0	115	215	1,973,287	11.66	21.79
44	C	1991	0	18	53	6,000,000	0.60	1.77
45	C	1991	0	3	100	3,564,258	0.17	5.61
46	C	1991	0	7	106	3,073,391	0.46	6.90
47	C	1991	0	3	7	3,188,299	0.19	0.44
48	C	1991	0	25	82	1,988,640	2.51	8.25
49	C	1991	0	1	2	35,971	5.56	11.12
50	C	1991	0	5	45	2,052,230	0.49	4.39
51	C	1991	0	22	75	1,983,896	2.22	7.56
52	C	1991	0	4	11	330,500	2.42	6.66
53	C	1991	0	66	130	2,900,000	4.55	8.97
54	C	1991	0	76	294	5,215,254	2.91	11.27
55	C	1991	0	8	52	3,368,987	0.47	3.09
Totals for 1991			8	2443	9122	367,103,076	1.33	4.97
		FIR=	4.36					
Max			2	246	1,353	74,382,694	11.66	21.79
Min			0	0	0	35,971	0.00	0.00
Average			0.1	44	166	6,674,601	1.94	6.30
Median			0.0	15	82	2,490,806	1.37	5.09
Std. Dev.			0.4	62	233	11,476,909	2.06	4.30

Contractors Responding to the 1992 CII Safety Survey

Company	Class	Year	Fatal.	LW Cases	RI Cases	Work hours	LWIR	RIR
1	C	1992	1	176	321	5,382,332	6.54	11.93
2	C	1992	0	15	30	1,082,020	2.77	5.55
3	C	1992	0	6	30	1,892,205	0.63	3.17
4	C	1992	1	111	203	14,492,364	1.53	2.80
5	C	1992	0	42	211	13,703,859	0.61	3.08
6	C	1992	0	131	520	16,731,374	1.57	6.22
7	C	1992	0	31	260	9,209,439	0.67	5.65
8	C	1992	0	337	529	21,775,055	3.10	4.86
9	C	1992	0	343	624	24,559,222	2.79	5.08
10	C	1992	0	3	20	1,037,000	0.58	3.86
11	C	1992	0	6	43	1,944,657	0.62	4.42
12	C	1992	0	2	2	209,708	1.91	1.91
13	C	1992	0	9	94	2,154,222	0.84	8.73
14	C	1992	0	11	31	2,318,271	0.95	2.67
15	C	1992	0	19	39	1,163,163	3.27	6.71
16	C	1992	0	51	148	16,932,482	0.60	1.75
17	C	1992	1	35	134	3,230,168	2.17	8.30
18	C	1992	1	54	901	60,711,517	0.18	2.97
19	C	1992	0	4	7	719,096	1.11	1.95
20	C	1992	0	17	71	5,026,253	0.68	2.83
21	C	1992	0	3	9	1,034,041	0.58	1.74
22	C	1992	0	5	30	2,856,426	0.35	2.10
23	C	1992	0	6	8	1,473,448	0.81	1.09
24	C	1992	0	211	570	14,970,683	2.82	7.61
25	C	1992	0	3	8	154,700	3.88	10.34
26	C	1992	0	6	51	867,518	1.38	11.76
27	C	1992	0	7	37	1,143,047	1.22	6.47
28	C	1992	0	1	23	1,747,363	0.11	2.63
29	C	1992	0	38	322	10,100,000	0.75	6.38
30	C	1992	0	12	154	8,600,000	0.28	3.58
31	C	1992	0	12	24	632,540	3.79	7.59
32	C	1992	1	43	72	1,667,047	5.16	8.64
33	C	1992	1	57	408	27,418,135	0.42	2.98
34	C	1992	0	3	30	1,566,490	0.38	3.83
35	C	1992	0	23	60	2,974,790	1.55	4.03
36	C	1992	2	58	148	8,149,471	1.42	3.63
37	C	1992	0	0	2	292,000	0.00	1.37
38	C	1992	0	37	176	8,191,788	0.90	4.30
39	C	1992	0	1	6	645,669	0.31	1.86
40	C	1992	0	6	146	7,434,203	0.16	3.93
41	C	1992	0	2	75	5,777,611	0.07	2.60
42	C	1992	0	2	7	427,100	0.94	3.28
43	C	1992	1	23	302	12,700,000	0.36	4.76
44	C	1992	0	106	246	3,159,818	6.71	15.57
45	C	1992	0	10	45	9,800,000	0.20	0.92
46	C	1992	0	9	68	3,519,558	0.51	3.86
47	C	1992	0	7	77	3,373,855	0.41	4.56
48	C	1992	0	2	4	3,333,608	0.12	0.24
49	C	1992	0	43	103	1,655,000	5.20	12.45
50	C	1992	0	0	3	50,093	0.00	11.98
51	C	1992	0	19	43	1,606,225	2.37	5.35
52	C	1992	0	4	23	2,118,750	0.38	2.17
53	C	1992	0	15	152	6,683,720	0.45	4.55
54	C	1992	0	3	7	313,307	1.92	4.47
55	C	1992	0	29	81	2,632,600	2.20	6.15
56	C	1992	0	69	311	5,366,346	2.57	11.59
57	C	1992	0	12	66	6,077,400	0.39	2.17
Totals for 1992			9	2,290	8,115	374,788,757	1.22	4.33
		FIR=	4.80					
Max			2	343	901	60,711,517	6.71	15.57
Min			0	0	2	50,093	0.00	0.24
Average			0.2	40	142	6,575,241	1.48	5.03
Median			0.0	12	68	2,974,790	0.81	4.03
Std. Dev.			0.4	72	186	9,700,439	1.60	3.39

Contractors Responding to the 1993 CII Safety Survey

Company	Class	Year	Fatal.	LW Cases	RI Cases	Work hours	LWIR	RIR
1	C	1993	1	126	246	5,961,136	4.23	8.25
2	C	1993	1	57	169	9,748,015	1.17	3.47
3	C	1993	0	59	366	15,989,496	0.74	4.58
4	C	1993	0	92	766	59,256,246	0.31	2.59
5	C	1993	1	119	1499	86,322,477	0.28	3.47
6	C	1993	0	1	3	618,950	0.32	0.97
7	C	1993	0	9	70	1,863,670	0.97	7.51
8	C	1993	0	13	77	1,874,635	1.39	8.21
9	C	1993	0	6	144	2,866,097	0.42	10.05
10	C	1993	0	9	39	2,314,469	0.78	3.37
11	C	1993	0	23	59	3,140,000	1.46	3.76
12	C	1993	0	19	76	2,445,441	1.55	6.22
13	C	1993	2	49	517	58,703,867	0.17	1.76
14	C	1993	0	73	205	31,912,309	0.46	1.28
15	C	1993	0	1	6	1,622,088	0.12	0.74
16	C	1993	0	12	127	6,943,284	0.35	3.66
17	C	1993	1	7	32	10,846,254	0.13	0.59
18	C	1993	0	5	24	2,212,243	0.45	2.17
19	C	1993	0	2	3	77,424	5.17	7.75
20	C	1993	0	13	77	830,720	3.13	18.54
21	C	1993	0	5	46	3,243,945	0.31	2.84
22	C	1993	2	37	475	20,800,000	0.36	4.57
23	C	1993	0	10	21	691,164	2.89	6.08
24	C	1993	0	8	23	823,972	1.94	5.58
25	C	1993	0	32	250	14,018,795	0.46	3.57
26	C	1993	0	1	5	432,987	0.46	2.31
27	C	1993	0	2	3	2,405,791	0.17	0.25
28	C	1993	0	35	139	6,653,201	1.05	4.18
29	C	1993	0	6	13	365,385	3.28	7.12
30	C	1993	0	44	377	9,411,368	0.94	8.01
31	C	1993	0	0	5	988,522	0.00	1.01
32	C	1993	0	1	14	364,538	0.55	7.68
33	C	1993	0	5	33	1,713,593	0.58	3.85
34	C	1993	0	0	4	514,280	0.00	1.56
35	C	1993	0	57	84	2,732,264	4.17	6.15
36	C	1993	0	93	187	2,812,187	6.61	13.30
37	C	1993	0	15	38	6,985,413	0.43	1.09
38	C	1993	1	11	61	4,649,799	0.47	2.62
39	C	1993	2	14	75	5,551,507	0.50	2.70
40	C	1993	1	2	14	4,240,575	0.09	0.66
41	C	1993	0	1	2	763,303	0.26	0.52
42	C	1993	0	2	8	261,487	1.53	6.12
43	C	1993	0	28	63	2,450,758	2.29	5.14
44	C	1993	0	28	269	8,969,655	0.62	6.00
45	C	1993	0	1	1	768,084	0.26	0.26
46	C	1993	0	2	2	227,700	1.76	1.76
47	C	1993	1	28	39	1,593,774	3.51	4.89
48	C	1993	0	40	290	5,750,595	1.39	10.09
49	C	1993	0	11	59	4,034,173	0.55	2.93
Totals for 1993			13	1214	7105	419,767,636	0.58	3.39
		FIR =	6.19					
Max			2	126	1,499	86,322,477	6.61	18.54
Min			0	0	1	77,424	0.00	0.25
Average			0.3	25	145	8,566,686	1.25	4.53
Median			0.0	11	59	2,732,264	0.55	3.66
Std. Dev.			0.6	31	253	16,762,312	1.47	3.61

Contractors Responding to the 1994 CII Safety Survey

Company	Class	Year	Fatal.	LW Cases	RI Cases	Work hours	LWIR	RIR
1	C	1994	0	5	6	2,205,699	0.45	0.54
2	C	1994	0	3	6	4,610,224	0.13	0.26
3	C	1994	0	31	92	8,436,119	0.73	2.18
4	C	1994	0	121	793	58,279,000	0.42	2.72
6	C	1994	0	230	400	14,759,462	3.12	5.42
7	C	1994	0	1	13	6,286,145	0.03	0.41
8	C	1994	2	713	1300	78,464,534	1.82	3.31
9	C	1994	0	3	3	274,825	2.18	2.18
10	C	1994	0	2	25	1,155,832	0.35	4.33
11	C	1994	0	0	3	127,223	0.00	4.72
12	C	1994	0	4	97	2,207,223	0.36	8.79
13	C	1994	0	18	66	6,602,142	0.55	2.00
14	C	1994	0	40	90	1,904,000	4.20	9.45
15	C	1994	2	32	407	64,602,914	0.10	1.26
16	C	1994	2	166	839	70,093,071	0.47	2.39
18	C	1994	0	9	70	6,399,838	0.28	2.19
19	C	1994	0	6	89	9,524,085	0.13	1.87
20	C	1994	0	3	16	2,090,259	0.29	1.53
21	C	1994	0	3	8	705,255	0.85	2.27
22	C	1994	1	5	86	2,280,400	0.44	7.54
23	C	1994	0	0	1	277,600	0.00	0.72
24	C	1994	0	11	104	1,024,309	2.15	20.31
25	C	1994	0	6	46	3,429,001	0.35	2.68
26	C	1994	0	3	3	513,791	1.17	1.17
27	C	1994	0	53	122	6,100,000	1.74	4.00
28	C	1994	0	10	51	3,732,967	0.54	2.73
29	C	1994	0	30	43	1,076,590	5.57	7.99
30	C	1994	0	1	2	459,738	0.44	0.87
31	C	1994	0	0	13	1,294,471	0.00	2.01
32	C	1994	0	0	1	564,065	0.00	0.35
33	C	1994	0	29	84	3,400,000	1.71	4.94
34	C	1994	0	1	15	2,565,419	0.08	1.17
35	C	1994	0	18	40	2,362,478	1.52	3.39
36	C	1994	0	38	277	27,423,985	0.28	2.02
37	C	1994	0	45	175	4,229,846	2.13	8.27
38	C	1994	1	13	41	2,191,870	1.19	3.74
39	C	1994	1	68	137	2,505,350	5.43	10.94
40	C	1994	0	0	2	144,143	0.00	2.78
41	C	1994	0	25	118	4,363,192	1.15	5.41
42	C	1994	0	8	54	7,167,657	0.22	1.51
43	C	1994	0	2	54	4,063,476	0.10	2.66
44	C	1994	0	0	37	2,640,249	0.00	2.80
45	C	1994	0	1	7	685,177	0.29	2.04
46	C	1994	0	0	2	288,362	0.00	1.39
47	C	1994	0	16	27	1,519,308	2.11	3.55
48	C	1994	0	13	108	6,189,639	0.42	3.49
49	C	1994	0	1	7	538,711	0.37	2.60
50	C	1994	0	35	84	4,818,080	1.45	3.49
51	C	1994	0	8	87	4,163,816	0.38	4.18
Totals for 1994			9	1830	6151	440,741,540	0.83	2.79
		FIR=	4.08					
Max			2	713	1,300	78,464,534	5.57	20.31
Min			0	0	1	127,223	0.00	0.35
Average			0.2	39	131	9,249,772	1.01	3.82
Median			0.0	8	53	2,535,385	0.42	2.73
Std. Dev.			0.5	111	250	18,976,582	1.34	3.50

Contractors Responding to the 1995 CII Safety Survey

Company	Class	Year	Fatal.	LW Cases	RI Cases	Work hours	LWIR	RIR
1	C	1995	0	0	2	1,039,874	0.00	0.38
2	C	1995	0	0	2	133,376	0.00	3.00
3	C	1995	0	2	12	963,100	0.42	2.49
4	C	1995	0	159	274	15,002,947	2.12	3.65
5	C	1995	0	87	525	53,296,000	0.33	1.97
7	C	1995	0	0	3	589,284	0.00	1.02
8	C	1995	0	0	14	2,357,136	0.00	1.19
9	C	1995	1	1	18	1,180,846	0.17	3.05
10	C	1995	1	340	1004	77,090,248	0.88	2.60
11	C	1995	0	55	201	25,964,481	0.42	1.55
12	C	1995	0	9	12	388,820	4.63	6.17
13	C	1995	0	1	25	1,268,347	0.16	3.94
14	C	1995	1	5	124	2,377,212	0.42	10.43
17	C	1995	0	214	516	67,269,012	0.64	1.53
18	C	1995	1	65	517	56,164,543	0.23	1.84
20	C	1995	0	1	8	3,253,530	0.06	0.49
21	C	1995	0	8	87	11,531,223	0.14	1.51
22	C	1995	0	8	50	3,424,978	0.47	2.92
23	C	1995	0	3	22	1,473,020	0.41	2.99
24	C	1995	0	13	119	1,356,566	1.92	17.54
25	C	1995	0	20	47	2,726,148	1.47	3.45
26	C	1995	2	35	457	25,600,000	0.27	3.57
27	C	1995	0	3	12	1,350,000	0.44	1.78
28	C	1995	0	13	28	832,540	3.12	6.73
30	C	1995	1	32	235	17,803,284	0.36	2.64
31	C	1995	0	39	163	6,006,562	1.30	5.43
32	C	1995	2	27	81	6,054,321	0.89	2.68
33	C	1995	0	0	1	477,761	0.00	0.42
34	C	1995	1	1	3	527,902	0.38	1.14
36	C	1995	0	41	48	1,560,977	5.25	6.15
37	C	1995	0	5	19	5,357,968	0.19	0.71
38	C	1995	0	8	30	2,395,710	0.67	2.50
41	C	1995	1	175	1506	71,960,724	0.49	4.19
42	C	1995	0	44	209	13,144,771	0.67	3.18
43	C	1995	0	43	113	3,496,266	2.46	6.46
44	C	1995	0	7	49	2,330,368	0.60	4.21
45	C	1995	0	0	1	1,600,000	0.00	0.13
46	C	1995	0	0	1	300,000	0.00	0.67
47	C	1995	0	20	107	13,798,282	0.29	1.55
48	C	1995	0	0	19	2,410,418	0.00	1.58
49	C	1995	0	1	2	358,840	0.56	1.11
50	C	1995	0	23	43	1,813,722	2.54	4.74
51	C	1995	0	2	6	1,712,040	0.23	0.70
52	C	1995	0	13	50	4,512,693	0.58	2.22
53	C	1995	0	8	25	4,199,357	0.38	1.19
Totals for 1995			11	1531	6790	518,455,197	0.59	2.62
		FIR=	4.24					
Max			2	340	1,506	77,090,248	5.25	17.54
Min			0	0	1	133,376	0.00	0.13
Average			0.2	34	151	11,521,227	0.81	3.10
Median			0.0	8	43	2,395,710	0.42	2.50
Std. Dev.			0.5	66	286	20,376,766	1.17	3.03

Contractors Responding to the 1996 CII Safety Survey

Company	Class	Year	Fatal.	LW Cases	RI Cases	Work hours	LWIR	RIR
1	C	1996	0	0	7	1,664,571	0.00000	0.84106
2	C	1996	0	0	0	253,625	0.00000	0.00000
3	C	1996	0	40	437	40,502,000	0.19752	2.15792
4	C	1996	0	14	133	7,199,429	0.38892	3.69474
5	C	1996	0	27	277	18,460,121	0.29252	3.00106
6	C	1996	0	6	37	8,671,443	0.13839	0.85338
7	C	1996	0	3	21	6,590,103	0.09105	0.63732
8	C	1996	0	3	18	1,311,387	0.45753	2.74519
9	C	1996	0	567	1034	87,315,085	1.29874	2.36843
10	C	1996	0	81	201	25,964,481	0.62393	1.54827
11	C	1996	0	1	1	803,928	0.24878	0.24878
12	C	1996	0	2	5	2,900,000	0.13793	0.34483
13	C	1996	0	7	105	3,740,565	0.37428	5.61413
14	C	1996	0	9	95	10,125,235	0.17777	1.87650
15	C	1996	0	0	3	1,049,596	0.00000	0.57165
16	C	1996	0	44	323	10,320,746	0.85265	6.25924
17	C	1996	1	10	49	1,168,000	1.71233	8.39041
18	C	1996	0	25	523	67,983,853	0.07355	1.53860
19	C	1996	0	83	558	100,341,976	0.16543	1.11220
20	C	1996	0	0	0	2,028,790	0.00000	0.00000
21	C	1996	0	16	64	5,167,275	0.61928	2.47713
22	C	1996	0	7	35	3,583,261	0.39071	1.95353
23	C	1996	0	1	18	1,676,526	0.11929	2.14730
24	C	1996	0	0	1	515,648	0.00000	0.38786
25	C	1996	0	9	12	1,433,706	1.25549	1.67398
26	C	1996	0	7	134	1,896,576	0.73817	14.13073
27	C	1996	0	26	75	6,289,369	0.82679	2.38498
28	C	1996	1	10	38	5,057,068	0.39549	1.50285
29	C	1996	0	31	224	29,908,388	0.20730	1.49791
30	C	1996	0	43	201	9,669,835	0.88936	4.15726
31	C	1996	0	11	18	2,687,194	0.81870	1.33969
32	C	1996	0	9	18	1,811,869	0.99345	1.98690
33	C	1996	1	45	144	19,070,204	0.47194	1.51021
34	C	1996	0	2	39	6,965,177	0.05743	1.11986
35	C	1996	0	2	29	1,967,407	0.20331	2.94804
36	C	1996	1	41	246	14,237,133	0.57596	3.45575
37	C	1996	0	11	30	1,940,695	1.13361	3.09168
38	C	1996	0	36	91	2,403,751	2.99532	7.57150
39	C	1996	0	0	5	749,150	0.00000	1.33485
40	C	1996	0	1	1	153,679	1.30141	1.30141
41	C	1996	0	7	116	9,818,886	0.14258	2.36279
42	C	1996	0	5	42	3,175,170	0.31494	2.64553
43	C	1996	0	9	29	6,319,823	0.28482	0.91775
44	C	1996	0	0	9	1,031,571	0.00000	1.74491
45	C	1996	0	4	23	4,040,194	0.19801	1.13856
46	C	1996	0	16	263	22,000,000	0.14545	2.39091
Totals for 1996			4	1271	5732	1,200,649,063	0.21	0.95
		FIR=	0.67					
Max			1	567	1034	100341976	3	14
Min			0	0	0	153679	0	0
Average			0.1	28	125	12216619	0	2
Median			0.0	9	39	3890380	0	2
Std. Dev.			0.3	84	194	21554364	1	3

Appendix G: Sample CII Benchmarking and Metrics Survey
CII Benchmarking and Metrics
Completed Project Data: Owners (Version 2.0)
(*Selected Questions*)

1. Your Company: _____

2. Your Project I.D. _____ (You may use any reference to protect the project's identity. The purpose of this I.D. is to help you and CII personnel identify the questionnaire correctly if clarification of data is needed and to prevent duplicate project entries.)

3. Project Location: Domestic _____ , USA
State
International _____
Country

4. Contact Person (name of the person filling out this form): _____

5. Contact Phone No. (____) _____ 6. Contact Fax No. (___) _____

7. Principal Type of Project (Check only one. If you feel the project does not have a principal type, but is an even mixture of two or more of those listed, please attach a short description of the project. If the project type does not appear in the list, please describe in the space next to "Other."):

_____Industrial

_____Buildings
_____Electrical Distribution
_____Oil Exploration/Production
_____Highrise Office
_____Oil Refining
_____Warehouse
_____Pulp and Paper
_____Hospital
_____Chemical Mfg.
_____Laboratory
_____Environmental
_____School
_____Pharmaceuticals Mfg.
_____Prison
_____Metals Refining/Processing
_____Microelectronics Mfg.
_____Consumer Products Mfg.
_____Natural Gas Processing
_____Automotive Mfg.
_____Foods

_____Infrastructure

_____Electrical (Generating)
_____Lowrise Office
_____Highway
_____Navigation
_____Flood Control
_____Rail
_____Water/Wastewater
_____ Airport
_____Tunneling
_____Marine Facilities
_____Mining

_____Hotel
_____Maintenance
_____Parking Garage
_____Retail

_____Other (Please Describe_____

8. This project was (check only one): Grass Roots_____ Modernization _____ Addition _____

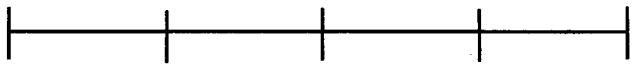
_____ Other (Please describe)_____

Appendix G: Sample CII Benchmarking and Metrics Survey
CII Benchmarking and Metrics
Completed Project Data: Owners (Version 2.0)
(*Selected Questions*)

17b. Project Complexity

Place a mark anywhere on the scale below that best describes the level of complexity for this project as compared to other projects from the same industry sector

Low Complexity — Average Complexity — High Complexity



- **Low Complexity -** Characterized by the use of no unproven technology.
- **High Complexity -** Characterized by the use of unproven technology.

18. Workhours and Accident Data

Please record total craft workhours, the number of recordable injuries, and the number of lost workday cases separately in the spaces provided below.

- Use the U.S. Department of Labor's OSHA definitions for recordable injuries and lost workday cases among this project's craft workers. If you do not track in accordance with these definitions, write "UNK" in the recordable injuries and lost workday cases columns.
- Write "UNK" in any space for which the information is unavailable or incomplete.
- A consolidated project OSHA 200 log is the best source for the data.

Total Craft Workhours	OSHA Recordable Injuries	OSHA Lost Workday Cases

18a. How many of the craft workhours reported in the table above were "overtime" (or "premium time")? (Write "UNK" in the blank if you don't have this information)

_____ hrs

Appendix G: Sample CII Benchmarking and Metrics Survey

CII Benchmarking and Metrics

Completed Project Data: Owners (Version 2.0)

(*Selected Questions*)

Safety Practices

Safety includes the site-specific program and efforts to create a project environment and state of consciousness which embraces the concept that all accidents are preventable and that zero accidents is an obtainable goal. If this project was accident free, check "NA" as appropriate for questions 27 through 30.

	Yes	No	
19.	___	___	This project had a written site-specific safety plan.
20.	___	___	This project had a written site-specific emergency plan.
21.	___	___	This project had a site safety supervisor.
22.	___	___	The site safety supervisor for this project was full-time.
23.	___	___	This project had a written safety incentive program for hourly craft employees.
24.	___	___	Toolbox safety meetings were required.
25.	___	___	This project required prehire substance abuse testing of contractor employees.
26.	___	___	Contractor employees were randomly screened for alcohol and drugs.

27. Substance abuse tests were conducted after an accident:

_____ Always _____ Sometimes _____ Seldom _____ Never ___ NA

28. Accidents were formally investigated:

_____ Always _____ Sometimes _____ Seldom _____ Never ___ NA

29. Near-misses were formally investigated:

_____ Always _____ Sometimes _____ Seldom _____ Never ___ NA

30. Senior management reviewed accidents:

_____ Always _____ Sometimes _____ Seldom _____ Never ___ NA

31. Safety was a high priority topic at all pre-construction and construction meetings:

_____ Always _____ Sometimes _____ Seldom _____ Never

32. Safety records were a criterion for contractor/subcontractor selection:

_____ Always _____ Sometimes _____ Seldom _____ Never

33... Pre-task planning for safety was conducted by contractor foremen:

_____ Always _____ Sometimes _____ Seldom _____ Never

34. Jobsite-specific orientation conducted for new contractor and subcontractor employees:

_____ Always _____ Sometimes _____ Seldom _____ Never

35. This question is for Contractors only.

Appendix H: Sample U.S. Navy Benchmarking and Metrics Questionnarie

U. S. NAVY BENCHMARKING & METRICS QUESTIONAIRE

FOR THESIS "SAFETY PERFORMANCE AND THE USE OF BEST PRACTICES TO REDUCE LOST WORKHOURS AND ACCIDENTS"

1. Your ROICC Office: _____

2. Project I.D. _____ (You may use any reference to protect the project's identity. The purpose of this I.D. is to help identify the questionnaire correctly if clarification of data is needed and to prevent duplicate project entries.)

3. Project Location: Domestic _____ , USA
State
International _____
Country

4. Contact Person (name of the person filling out this form): _____

5. Contact Phone No. (____) _____ **6.** Contact Fax No. (____) _____

7. Principal Type of Project (Check only one. If you feel the project does not have a principal type, but is an even mixture of two or more of those listed, please attach a short description of the project. If the project type does not appear in the list, please describe in the space next to "Other."):

Industrial	Infrastructure	Buildings
_____Electrical (Generating)	_____Electrical Distribution	
_____Lowrise Office		
_____Oil Exploration/Production	_____Highway/Roads	
_____Highrise Office		
_____Oil Refining	_____Navigation	
_____Warehouse		
_____Pulp and Paper	_____Flood Control	
_____Hospital		
_____Chemical Mfg.	_____Rail	
_____Laboratory		
_____Environmental	_____Water/Wastewater	
_____School		
_____Pharmaceuticals Mfg.	_____ Airport	
_____Prison		
_____Metals Refining/Processing	_____Tunneling	_____BEQ/BOQ
_____ Microelectronics Mfg.	_____Marine Facilities	_____Maint Fac
_____Consumer Products Mfg.	_____Mining	_____Parking
_____Natural Gas Processing		_____Retail
_____Automotive Mfg.		

8. This project was (check only one): Grass Roots_____ Modernization _____ Addition _____

Grass roots - a new facility from the foundations and up. A project requiring demolition of an existing facility before new construction begins is also classified as grass roots.

Modernization - a facility for which a substantial amount of the equipment, structure, or other components is replaced or modified, and which may expand capacity and/or improve the process or facility.

Addition - a new addition that ties in to an existing facility, often intended to expand capacity.

_____ Other (Please describe)_____

_____

9. Workhours and Accident Data

Please record total craft workhours, the number of recordable injuries, and the number of lost workday cases separately in the spaces provided below.

- Use the U.S. Department of Labor's OSHA definitions for recordable injuries and lost workday cases among this project's craft workers. If you do not track in accordance with these definitions, write "UNK" in the recordable injuries and lost workday cases columns.
- Write "UNK" in any space for which the information is unavailable or incomplete.
- A consolidated project OSHA 200 log is the best source for the data.

Total Craft Workhours	OSHA Recordable Injuries	OSHA Lost Workday Cases

9a. How many of the craft workhours reported in the table above were "overtime" (or "premium time")? (Write "UNK" in the blank if you don't have this information)

_____hrs

Safety Practices

Safety includes the site-specific program and efforts to create a project environment and state of consciousness which embraces the concept that all accidents are preventable and that zero accidents is an obtainable goal. If this project was accident free, check "NA" as appropriate for questions 18 through 21.

	Yes	No	
10.	___	___	This project had a written site-specific safety plan.
11.	___	___	This project had a written site-specific emergency plan.
12.	___	___	This project had a site safety supervisor.
13.	___	___	The site safety supervisor for this project was full-time.
14.	___	___	This project had a written safety incentive program for hourly craft employees.
15.	___	___	Toolbox safety meetings were required.
16.	___	___	This project required prehire substance abuse testing of contractor employees.
17.	___	___	Contractor employees were randomly screened for alcohol and drugs.

18. Substance abuse tests were conducted after an accident:

_____ Always _____ Sometimes _____ Seldom _____ Never _____ NA

19. Accidents were formally investigated:

_____ Always _____ Sometimes _____ Seldom _____ Never _____ NA

20. Near-misses were formally investigated:

_____ Always _____ Sometimes _____ Seldom _____ Never _____ NA

21. Senior management reviewed accidents:

_____ Always _____ Sometimes _____ Seldom _____ Never _____ NA

22. Safety was a high priority topic at all pre-construction and construction meetings:

_____ Always _____ Sometimes _____ Seldom _____ Never

23. Safety records were a criterion for contractor/subcontractor selection:

_____ Always _____ Sometimes _____ Seldom _____ Never

24. Contractor foremen conducted pre-task planning for safety:

_____ Always _____ Sometimes _____ Seldom _____ Never

25. Jobsite-specific orientation was conducted for new contractor and subcontractor employees:

Appendix I: Best Practices #1-97: Contractor Performance

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
200 STOVALL STREET
ALEXANDRIA VA 22332-2300

Ser 111A-97-107
1 Dec 97

From: Commander, Naval Facilities Engineering Command

Subj: BEST PRACTICES #1-97: CONTRACTOR PERFORMANCE-SAFETY AND HEALTH

Ref: (a) MSG, NAVFAC-09, DTG 160853Z APR 97
(b) COMNAVFACENGCOM ltr Ser I *1/97-007* of 20 May 97
(c) FY 1999-2003 Defense Planning Guidance

1. Reference(a) described several MILCONIBRACON fatal accidents in FY97 and asked the our EFDs and PWCs to continue to "do all we can to provide quality service in a safe manner." Ref (b) provided guidance on simplifying the Source Selection Procedure, use of Past Performance in source selections, and maintaining past performance databases. Ref (c) requires "a near term goal of zero Class A accidents".

2. The Navy has experienced many fatal and serious contractor accidents over the past several years. According to the Associated General Contractors, Construction Industry Institute and the National Safety Council, we only need to hire safer contractors to solve this problem. Experience indicates that safe contractors also provide quality products and services. Delivering the best value to our customers remains our primary goal. Safety and health may be considered as an element of responsibility. The contracting officer may consider a finding of non-responsibility when a contractor has received a willful OSHA citation and has not implemented corrective action. Also, the contractor's past safety and health performance may be considered a subfactor of past performance.

3. Information on past safety and health performance may be obtained and be included as an element or subfactor of Past Performance Evaluation. In the Pre-Award Information Section, each offeror may be requested to furnish the following safety and health program information:

a. Occupational Safety and Health Act (OS HA) incidence rate for last five years.
b. OSHA severity rate for the last five years.
c. Experience Modification Rate (EMR) for the state in which the work is to be accomplished, for the current year, plus last five years.
d. Federal, State and Municipal "OSHA-type" Citation from last five years.
e. Offeror's safety and health quality control program.

4. If a selected contractor (at any tier) has an EMR greater than 1.2 (20% insurance premium) and/or an incident rate higher than 5.0 (5 lost time accidents per 200,000 hours worked), the Contracting Officer should consider a special meeting, prior to any work performance, to have the contractor explain how they intend to maintain an accident free worksite. A full time safety technician or 3rd party safety monitor may be needed.

Subj: BEST PRACTICES #1-97: CONTRACTOR PERFORMANCE-SAFETY AND HEALTH

5. Contact Craig Schilder, FAC-SF, 703-325-0435 or Joyce Runyan, FAC-ACQ, 703-325-9019 or Miguel Lopez, FAC-ACQ, 703-325-9015 for assistance.

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NAVFAL FACILITIES CONTRACTS TRAINING CENTER
NAVAL FACILITIES CONTRACT OFFICE, PORT HUENEME (27)

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Vita

James Treacy Stone was born in Tuscaloosa, Alabama on June 23, 1965, the son of Barbara Callahan Stone and Luther Mason Stone. After completing his work at the Shades Valley Annex, Resource Learning Center, Birmingham, Alabama, in 1983, he entered Tulane University in New Orleans, Louisiana. He earned his Bachelor of Science in Civil Engineering degree in May 1987. During the following years he served as an officer in the United States Navy. In June 1997, Lieutenant Stone entered the Graduate School of the University of Texas at Austin.

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